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THE TUTOR's ASSISTANT;

BEING

A COMPENDIUM of ARITHMETIC,

AND

A Complete Question-Book:

CONTAINING,

I. *Arithmetic* in Whole Numbers; being a brief Explanation of all its Rules, in a new and more concise Method than any hitherto published; with an *Application* to each Rule, consisting of a large Variety of Questions in real Business, with their Answers annexed.

II. *Vulgar Fractions*, which are treated with a great deal of Plainness and Perspicuity.

III. *Decimals*, with the *Extraction* of the *Square*, *Cube*, and *Biquadrate* Roots, after a very plain and familiar Manner; in which are set down *Rules* for the easy Calculation of *Interest*, *Annuities*, and *Pensions* in *Arrears*, the *present Worth* of *Annuities*, &c. either by Simple or Compound Interest.

IV. *Duodecimals*, or *Multiplication* of Feet and Inches, with Examples applied to measuring and working by Multiplication, Practice, and Decimals.

V. The *Mensuration* of *Circles*, &c.

VI. A *Collection* of *Questions* set down promiscuously, for the greater Trial of the foregoing *Rules*.

VII. *A Course* of *Book-Keeping*, according to the method of *Single Entry*; with a description of the Books, and directions for using them.

TO WHICH ARE ADDED,

A new and very short Method of extracting the CUBE ROOT, *and a* GENERAL TABLE *for the ready calculating the* INTEREST *of any Sum of Money, at any Rate per Cent. likewise* Rents, Salaries, &c.

The Whole adapted as a QUESTION-BOOK for Schools, or REMEMBRANCER and INSTRUCTOR to such as have some Knowledge therein.

This Work having been perused by several Eminent MATHEMATICIANS *and* ACCOMPTANTS, *is recommended as the best* COMPENDIUM *hitherto published, for the Use of* SCHOOLS, *or for* PRIVATE PERSONS.

By FRANCIS WALKINGAME,

WRITING-MASTER & ACCOMPTANT.

A NEW EDITION,

With the Addition of Book-Keeping by Single Entry.

Carefully Revised, and every Question wrought anew,

By WILLIAM TAYLOR;

Author of a Complete System of Arithmetic; the Measurer's Assistant, Trader's Sure Guide, &c.

BIRMINGHAM:

Printed for the Editor, and sold by SWINNEY & WALKER, in the HIGH-STREET, and all other BOOKSELLERS, M,DCC,XCII.

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PREFACE.

THE Public, no doubt, will be ſurprized to find there is another attempt made to publiſh a Book of ARITHMETIC, when there are ſuch numbers already extant on the ſame Subject, and ſeveral of them that have ſo lately made their appearance in the World; but, I flatter myſelf, that the following reaſons which induced me to compile it, the Method, and the Conciſeneſs of the Rules, which are laid down in ſo plain and familiar a manner, will have ſome weight towards its having a favourable reception.

Having ſome time ago drawn up a Set of Rules, and proper Queſtions, with their Anſwers annexed, for the uſe of my own School, and divided them into ſeveral Books, as well for more eaſe to myſelf, as the readier improvement of my Scholars, I found them, by experience, of infinite uſe; for when a maſter takes upon him that laborious (though unneceſſary) method of writing out the Rules and Queſtions in the childrens books, he muſt either be toiling and

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ſlaving himſelf after the fatigue of the School is over, to get ready the books for the next day, or elſe muſt loſe that time which would be much better ſpent in inſtructing and opening the minds of his Pupils. There was, however, ſtill an inconvenience which hindered them from giving me the Satisfaction I at firſt expected; *i. e.* where there are ſeveral boys in a claſs, ſome one or other muſt wait till the boy who firſt has the book, finiſhes the writing out of thoſe rules or queſtions he wants; which detains the others from making that progreſs they otherwiſe might, had they a proper Book of Rules and Examples for each; to remedy which, I was prompted to compile one, in order to have it printed, that might not only be of uſe to my own School, but to ſuch others as would have their Scholars make a quick progreſs. It will alſo be of great uſe to ſuch Gentlemen as have acquired ſome knowledge of numbers at School, to make them the more perfect; likewiſe to ſuch as have completed themſelves therein, it will prove after an impartial peruſal, on account of its great variety and brevity, a moſt agreeable and entertaining Exerciſe Book. I ſhall not preſume to ſay any thing more in favour of this Work, but beg leave to refer the unprejudiced reader to the remark of a certain Author *, concerning compoſitions of this nature. His words are as follow:

"And now, after all, it is poſſible that ſome "who like beſt to tread the old beaten path, "and

* Dilworth.

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" and to ſweat at their buſineſs, when they may
" do it with pleaſure, may ſtart an objection
" againſt the uſe of this well-intended ASSIST-
" ANT, becauſe the courſe of ARITHMETIC is
" always the ſame; and therefore ſay, *That*
" *ſome boys lazily inclined, when they ſee another*
" *at work upon the ſame Queſtion, will be apt to*
" *make his operation paſs for their own.* But theſe
" little forgeries are ſoon detected, by the dili-
" gence of the TUTOR: therefore, as different
" queſtions to different boys do not in the leaſt
" promote their improvement, ſo neither do the
" queſtions hinder it. Neither is it in the power
" of any Maſter (in the courſe of his buſineſs)
" how full of ſpirits ſo ever he be, to frame new
" queſtions at pleaſure, in any Rule; but the
" ſame queſtion will frequently occur in the
" ſame Rule, notwithſtanding his greateſt care
" and ſkill to the contrary.

" It may alſo be further objected, *That to*
" *teach by a printed Book is an argument of Igno-*
" *rance and incapacity*; which is no leſs trifling
" than the former. He, indeed, (if any ſuch
" there be) who is afraid his Scholars will im-
" prove too faſt, will, undoubtedly, decry this
" method: But that Maſter's ignorance can
" never be brought in queſtion, who can begin
" and end it readily; and, moſt certainly, that
" ſcholar's non-improvement can be as little
" queſtioned, who makes a much greater pro-
" greſs by this than by the common method."

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To enter into a long detail of every Rule, would tire the reader, and ſwell the Preface to an unuſual length; I ſhall, therefore, only give a general idea of the method of proceeding, and leave the reſt to ſpeak for itſelf; which, I hope, the kind reader will find to anſwer the title, and the recommendation given it. As to the Rules, they follow in the ſame manner as the Table of Contents ſpecifies, and in much the ſame order as they are generally taught in Schools. I have gone through the four fundamental Rules in integers firſt, before thoſe of the ſeveral denominations: In order that they being well underſtood, the latter will be performed with much more eaſe and diſpatch, according to the rules ſhewn, than by the cuſtomary method of dotting. In Multiplication I have ſhewn both the beauty and uſe of that excellent Rule, in reſolving moſt Queſtions that occur in merchandizing; and have prefixed before Reduction, ſeveral bills of Parcels, which are applicable to real buſineſs. In working Intereſt by Decimals, I have added Tables to the Rules, for the readier calculating Annuities, &c. and have not only ſhewn the uſe, but the method of making them. I have alſo added to this *Edition* a NEW RULE for extracting the *Cube Root*, being a much ſhorter way than any that is already publiſhed; as likewiſe an Intereſt Table, calculated for the eaſier finding the Intereſt of any Sum of money at any Rate *per Cent.* by Multiplication and Addition only; it is alſo uſeful in calculating Rates, Incomes, and Servants Wages, for any number of Months, Weeks, or Days; and I may venture to ſay, I have gone through the whole

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whole with ſo much plainneſs and perſpicuity, that there is none better extant.

I have nothing further to add, but a return of my ſincere thanks to all thoſe Gentlemen, Schoolmaſters, and others, whoſe kind approbation and encouragement hath now eſtabliſhed the uſe of this book in almoſt every School of eminence throughout the Kingdom: But I think my gratitude more eſpecially due to thoſe who have favoured me with their remarks; though, I muſt ſtill beg of every candid and judicious Reader, that if he ſhould, by chance, find a tranſpoſition of a Letter, or a falſe Figure, to excuſe it; for, notwithſtanding there has been great care taken in correcting, yet errors of the Preſs will inevitably creep in; and ſome may alſo have ſlipped my obſervation: In either of which caſes, the Admonition of a good-natured Reader will be very acceptable to his

Much obliged,

And moſt obedient

Humble Servant,

F. WALKINGAME.

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Juſt publiſhed, by SWINNEY & WALKER, *Birmingham,*

THE SCHOOL and FAMILY

NEW TESTAMENT:

Containing the Life of our Lord and Saviour

JESUS CHRIST:

WITH

NOTES and ILLUSTRATIONS.

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Explanation

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Explanation *of the* Characters *made use of in this* COMPENDIUM.

= *Equal.*	The Sign of Equality; as, 4 qrs. = 1 cwt. signifies, that 4 qrs. are equal to 1 cwt.
—*Minus or Less.*	The Sign of Subtraction; as, 8—2=6, that is, 8 lessened by 2 is equal to 6.
+*Plus or more.*	The Sign of Addition; as, 4+4=8, that is, 4 added to 4 more is equal to 8.
×*Multiplied by.*	The Sign of Multiplication; as, 4×6=24, that is, 4 multiplied by 6 is equal to 24.
÷ *Divided by.*	The Sign of Division; as, 8÷2=4, that is, 8 divided by 2 is equal to 4.
$\frac{2357}{63}$	Numbers placed like a Fraction do likewise denote Division; the upper number being the Dividend and the lower the Divisor.
: : *So is.*	The Sign of Proportion; as, 2 : 4 : : 8 : 16, that is, as 2 is to 4, so is 8 to 16.
7—2+5=10.	Shews that the difference between 2 and 7 added to 5 is equal to 10.
$\overline{9-2+5}$=2.	Signifies that the Sum of 2 and 5 taken from 9, is equal to 2.
$\surd$	Prefixed to any number, signifies the Square Root of that number is required.
$\surd^3$	Signifies the Cube, or Third Power.
$\surd^4$	Denotes the Biquadrate, or the Fourth Power, &c.
i. e.	*id est*, that is.

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THE

TUTOR's ASSISTANT;

BEING A

COMPENDIUM OF ARITHMETIC.

PART I.

Arithmetic in Whole Numbers.

THE INTRODUCTION.

ARITHMETIC is the Art or Science of Computing by Numbers, and conſiſts both in Theory and Practice.

The Theory conſiders the Nature and Quality of Numbers, and demonſtrates the Reaſon of Practical Operations.

The Practice is that which ſhews the method of working by Numbers, ſo as to be the moſt uſeful and expeditious for Buſineſs, and has five principal or fundamental Rules for the Operations: *viz.*

NOTATION or NUMERATION, ADDITION, SUBTRACTION, MULTIPLICATION, and DIVISION.

NUMERATION

TEACHETH the different Value of Figures by their different Places, and to read and write any Sum or Number.

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The TABLE.

C Millions.	X Millions.	Millions.	C Thousands.	X Thousands.	Thousands.	Hundreds.	Tens.	Units.
9	8	7 ·	6	5	4 ·	3	2	1
9	0	0 ·	0	0	0 ·	0	0	0
	8	0 ·	0	0	0 ·	0	0	0
		7 ·	0	0	0 ·	0	0	0
			6	0	0 ·	0	0	0
				5	0 ·	0	0	0
					4 ·	0	0	0
						3	0	0
							2	0
								1

RULE. There are three Periods; the first on the Right Hand, Units; the Second, Thousands; and the Third, Millions; each consisting of Three Figures, or Places. Reckon the first Figure of each from the Left Hand as so many Hundreds, the next as Tens, and the Third as so many single Ones of what is written over them: As the first Period on the Left Hand is read thus, Nine Hundred Eighty-seven Millions; and so on for any of the rest.

The APPLICATION.

Write down in proper Figures the following Numbers:

Twenty-three.

Two Hundred and Fifty-four.

Three Thousand Two Hundred and Four.

Twenty-five thousand, Eight Hundred Fifty-six.

One Hundred Thirty-two Thousand, Two Hundred Forty-five.

Four Millions, Nine Hundred Forty-one Thousand, Four Hundred.

Twenty-seven Millions, One Hundred Fifty-seven Thousand, Eight Hundred Thirty-two.

Seven Hundred Twenty-two Millions, Two Hundred Thirty-one Thousand, Five Hundred and Four.

Six Hundred Two Millions, Two Hundred Ten Thousand, Five Hundred.

Write

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Write down in Words at Length the following Numbers:

35	2017	519007	5207054	65700047
59	5201	750058	2071909	90006057
172	20760	5900630	70054008	201900790

Notation by ROMAN *Letters.*

I One.	XXX Thirty.
II Two.	XL Forty.
III Three.	L Fifty.
IV Four.	LX Sixty.
V Five.	LXX Seventy.
VI Six.	LXXX Eighty.
VII Seven.	XC Ninety.
VIII Eight,	C Hundred.
IX Nine.	CC Two Hundred.
X Ten.	CCC Three Hundred.
XI Eleven.	CCCC Four Hundred.
XII Twelve	D Five Hundred.
XIII Thirteen	DC Six Hundred.
XIV Fourteen.	DCC Seven Hundred.
XV Fifteen.	DCCC Eight Hundred.
XVI Sixteen.	DCCCC Nine Hundred.
XVII Seventeen.	M One Thousand.
XVIII Eighteen.	MDCCXCII One Thousand Seven Hundred and Ninety two.
XIX Nineteen.	
XX Twenty.	

INTEGERS.

ADDITION

TEACHETH to add two or more Sums together, to make one whole or total Sum.

RULE. There muſt be due Regard had in placing the Figures one under the other, *i. e.* Units under Units, Tens under Tens, &c. then beginning with the firſt Row of Units, add them up to the Top; when done, ſet down the Units, and carry the Tens to the next, and ſo on; continuing to the laſt Row, at which ſet down the total Amount.

PROOF. Begin at the Top of the Sum, and reckon the Figures downwards, the ſame as you added them up, and, if the ſame as the firſt, the Sum is ſuppoſed to be right.

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ADDITION *and* SUBTRACTION TABLE.

1	2	3	4	5	6	7	8	9
2	4	5	6	7	8	9	10	11
3	5	6	7	8	9	10	11	12
4	6	7	8	9	10	11	12	13
5	7	8	9	10	11	12	13	14
6	8	9	10	11	12	13	14	15
7	9	10	11	12	13	14	15	16
8	10	11	12	13	14	15	16	17
9	11	12	13	14	15	16	17	18

£.	*Cwt.*	*Qrs.*	*Months.*	*£.*	*Years.*
2	27	275	1234	7524	27104
5	35	110	7098	3750	32547
7	47	473	3314	9147	10758
9	35	354	6732	3214	62590
2	41	271	2546	4725	75408
5	36	352	3709	2147	27973
4	59	471	4152	3254	85421
3	37	310	3705	2716	12706
7	14	473	1076	1047	10471
44	331				

SUBTRACTION

TEACHETH to take a leſs Number from a greater, and ſhews the Remainder, or Difference.

RULE. This being the Reverſe of Addition, you muſt borrow here (if it requires) what you ſtopped at there, always remembering to pay it to the next.

PROOF. Add the Remainder and leſs Line together, and if the ſame as the greater, it is right.

From	271	4754	42087	452705	271508	3750215
Take	154	2725	34096	327616	152471	2150874
Rem.	117					
Proof.	271					

MULTIPLICATION

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MULTIPLICATION

TEACHETH how to increaſe the greater of two Numbers given, as often as there are Units in the leſs; and compendiouſly performs the Office of many Additions:

To this Rule belong three principal Members: viz.

1, The Multiplicand, or Number to be multiplied:

2, The Multiplier, or Number by which you multiply:

3, The Product, or Number produced by multiplying.

RULE. Begin with that Figure that ſtands in the Unit's Place of the Multiplier, and with it multiply the firſt Figure in the Unit's Place of the Multiplicand. Set down the Units, and carry the Tens in Mind, till you have multiplied the next Figure in the Multiplicand by the ſame Figure in the Multiplier; to the Product of which add the Tens you kept in Mind, ſetting down the Units, and proceed as before, till the whole Line is multiplied.

PROOF. The uſual Way of proving Multiplication is, by caſting out the Nines from the Multiplicand and Multiplier: the Remainders put on each Side of a Croſs; multiply the Figures on each Side together, caſt the Nines from the Product, and put the Overplus at Top; then caſt out the Nines from the Product of the Multiplication, and its Remainder place at the Bottom; if it agree with the Top, the Work is ſuppoſed right. But the ſureſt Way is, to divide the Product by the Multiplicand, and the Quotient will be the ſame as the Multiplier.

MULTIPLICATION *and* DIVISION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	—	9	12	15	18	21	24	27	30	33	36
4	—	—	16	20	24	28	32	36	40	44	48
5	—	—	—	25	30	35	40	45	50	55	60
6	—	—	—	—	36	42	48	54	60	66	72
7	—	—	—	—	—	49	56	63	70	77	84
8	—	—	—	—	—	—	64	72	80	88	96
9	—	—	—	—	—	—	—	81	90	99	108
10	—	—	—	—	—	—	—	—	100	110	120
11	—	—	—	—	—	—	—	—	—	121	132
12	—	—	—	—	—	—	—	—	—	—	144

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Multiplicand	25104736	52471021	7925437521
Multiplier	2	3	4
Product	50209472		
	27104107	231047	7092516	3725104
	5	6	7	8
	4215406	2701057	31040171	35210472
	9	10	11	12

When the Multiplier is more than 12, and less than 20, multiply the Unit Figure in the Multiplier, adding to the Product the back Figure to that you multiplied.

5710592	5107252	7653210	92057165
13	14	15	16
6251721	9215324	2571341	3592104
17	18	19	19

When the Multiplier consists of several Figures, there must be as many Products as there are Figures in the Multiplier, observing to put the first Figure of every Product under that Figure you multiply by. Add the several Products together, and their Sum will be the total Product.

0	271041	32104	2710432	27501976
6+0	27	25	375	271
0	1897287	802600	1016412000	7453035496
	542082			
	7318107			

When Cyphers are placed between the significant Figures in the Multiplier, they may be omitted; but great Care must be taken that the next Figure must be put one Place more to the Left Hand, *i. e.* under the Figure you multiply by.

571204

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571204	7104325	5271094
27009	57020	590030
15427648836	405038611500	3110103592820

When there are Cyphers at the End of the Multiplicand or Multiplier, they may be omitted, by only multiplying by the reſt of the Figures, and ſetting down on the right Hand of the total product as many Cyphers as were omitted.

27100	379500	265000	574000
52600	274000	7200	630
1425460000	103983000000	1908000000	361620000

When the Multiplier is a compoſite Number, *i. e.* if any two Figures, being multiplied together, will make that Number, then multiply by one of thoſe Figures, and that Product by the other will give the Anſwer.

771039 by 35	921563 by 32	715241 by 56
26986365	29490016	40053496

DIVISION

TEACHETH to find how often one Number is contained in another; or to divide any Number into what Parts you pleaſe.

In this Rule there are three Numbers real, and a fourth accidental: *viz.*

1, The Dividend, or Number to be divided:

2, The Diviſor, or Number by which you Divide:

3, The Quotient, or Number that ſhews how often the Diviſor is contained in the Dividend:

4th, or accidental Number, is what remains when the Work is finiſhed, and is of the ſame Name as the Dividend.

RULE. When the Diviſor is leſs than 12, find how often it is contained in the firſt Figure of the Dividend: ſet it down under the Figure you divided, and carry the Overplus (if any) to the next in the Dividend, as ſo many Tens; then find how often the Diviſor is contained therein, ſet it down, and continue the ſame till you have gone through the

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the Line: But when the Divisor is more than 12, multiply it by the Quotient Figure; the Product subtract from the Dividend, and to the Remainder bring down the next Figure in the Dividend, and proceed as before, till the Figures are all brought down.

PROOF. Multiply the Divisor and Quotient together, adding the Remainder (if any) and the Product will be the same as the Dividend.

	Dividend. Rem.		
Divisor	2)725107(1	3)7210472(	4)7210416(
Quotient	362553 2		
Proof	725107	5)7203287(	6)5231037(
	7)2532701(	8)2547325(	9)2504730(6
	10)2750012(	11)2710513(	12)2710073(2

Divisor.	Dividend.	Quotient.
29)4172377(		143875
29		29
127	1294875	
116	2877750	
.112	2 Rem.	
87	4172377 Proof.	
.253		
232		
.217		
203		
.147		
145		
Rem. ..2		

37)7210473(194877
473)2104721(4449
275)3720147(13527
3701)72109521(19483
3576)7210472 6(20163
2510)63210476(25183
25204)321047217(12737
31709)52104732 1(16432
2701234)7210472532(2669
210472)35210719321 4(1672940
3721071)2107192 1473(5662

When

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When there are Cyphers at the End of the Divisor, they may be cut off, and as many places from off the Dividend, but must be annexed to the Remainder at last.

271|00)25473 2|21(939 5721|00)7253472|16(1267
373|000)752473|719(2017 215|000)6325104|997(29419

When the Divisor is a compositе Number (*i. e.* if any two Figures being multiplied together, will make that Number) then, by dividing the Dividend by one of those Figures, and that Quotient by the other, it will give the Quotient required. But as it sometimes happens that there is a remainder to each of the Quotients, and neither of them the true one, it may be found by this

RULE. Multiply the first Divisor into the last Remainder, to that Product add the first Remainder, which will give the true one.

Div. 3210473 by 27	7210473 by 35	6251043 by 42	5761034 by 54
118906. 11 Rem.	205013. 18 Rem.	148834. 15 Rem.	106685. 44 Rem.

MONEY.

Marked				Marked.
¼ *Farthing,*	4 Farthings	make	1 Penny. -	*d.*
½ *Halfpenny.*	12 Pence	-	1 Shilling. -	*s.*
¾ *Three Farthings.*	20 Shillings	-	1 Pound. -	*l.*

Farthings.

4 = 1 *Penny.*
48 = 12 = 1 *Shilling.*
960 = 240 = 20 = 1 *Pound.*

SHILLINGS.

s.	*l.*	*s.*
20 -	1 :	0
30 -	1 :	10
40 -	2 :	0
50 -	2 :	10
60 -	3 :	0
70 -	3 :	10
80 -	4 :	0
90 -	4 :	10
100 -	5 :	0
110 -	5 :	10
120 -	6 :	0
130 -	6 :	10

PENCE TABLE.

d.	*s.*	*d.*	*d.*	*s.*	*d.*
20 -	1 :	8	90 -	7 :	6
24 -	2 :	0	96 -	8 :	0
30 -	2 :	6	100 -	8 :	4
36 -	3 :	0	108 -	9 :	0
40 -	3 :	4	110 -	9 :	2
48 is	4 :	0	120 is	10 :	0
50 -	4 :	2	130 -	10 :	10
60 -	5 :	0	132 -	11 :	0
70 -	5 :	10	140 -	11 :	8
72 -	6 :	0	144 -	12 :	0
80 -	6 :	8	150 -	12 :	6
84 -	7 :	0	160 -	13 :	4

TROY

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TROY WEIGHT.

			Marked
24 Grains	make	1 Pennyweight.	*gr.* *dwt.*
20 Pennyweights		1 Ounce.	*oz.*
12 Ounces		1 Pound.	*lb.*

Grains.
24 = 1 Pennyweight.
480 = 20 = 1 Ounce.
5760 = 240 = 12 = 1 Pound.

By this Weight are weighed Gold, Silver, Jewels, Electuaries, and all Liquors.

N. B. The Standard for Gold Coin is 22 Carats of fine Gold, and 2 Carats of Copper, melted together. For Silver, is 11 *oz.* 2 *dwts* of fine Silver, and 18 *dwts.* of Copper.

25 *lb.* is a quarter of an *cwt.* 100 *lb.* 1 *cwt.*
20 *cwt.* 1 Ton of Gold or Silver.

AVOIRDUPOISE WEIGHT.

			Marked
16 Drams	make	1 Ounce	*dr.* *oz.*
16 Ounces		1 Pound	*lb.*
28 Pounds		1 Quarter	*qrs.*
4 Quarters, or 112 *lb.*		1 Hundred Weight	*cwt.*
20 Hundred Weight		1 Ton	*Ton.*

Drams
16 = 1 Ounce.
256 = 16 = 1 Pound.
7168 = 448 = 28 = 1 Quarter.
28672 = 1792 = 112 = 4 = 1 Hund. Weight.
573440 = 35840 = 2240 = 80 = 20 = 1 Ton.

There are several other Denominations in this Weight, that are used in some particular Goods: *viz.*

	lb.		*lb.*
A Firkin of Butter	56	A Stone of Iron, Shot or Horseman's wt.	14
Soap	94	Butcher's Meat	8
A Barrel of Anchovies	30	A Gallon of Train Oil	7½
Soap	256	A Truss of Straw	36
Raisins	112	New Hay	60
A Puncheon of Prunes	1120	Old Hay	56
A Fother of Lead, 19 *cwt.* 2 *qrs.*		36 Trusses a Load.	

Cheese

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Cheese and Butter.

A Clove, or Half Stone, 8 *lb.*

	lb.		*lb.*
A Wey in Suffolk, 32 Cloves, or	256	A Wey in Essex, 42 Cloves, or	336

Wool.

	lb.		*lb.*
A Clove	7	A Wey is 6 Tod and 1 Stone, or	182
A Stone	14	A Sack is 2 Weys, or	364
A Tod	28	A Last is 12 Sacks, or	4368

By this Weight is weighed any thing of a coarse or drossy Nature; as all Grocery and Chandlery Wares: Bread, and all Metals but Silver and Gold.

Note, 1 Pound Avoirdupoise is equal to 14 *oz.* 11 *dwts.* 15 *grs.* $\frac{1}{2}$ Troy.

APOTHECARIES WEIGHT.

			Marked
20 Grains	make	1 Scruple	℈
3 Scruples		1 Dram	ʒ
8 Drams		1 Ounce	℥
12 Ounces		1 Pound	℔

Grains

20 = 1 Scruple.
60 = 3 = 1 Dram.
480 = 24 = 8 = 1 Ounce.
5760 = 288 = 96 = 12 = 1 Pound.

Note, The Apothecaries mix their Medicines by this Rule, but buy and sell their Commodities by Avoirdupoise Weight.

The Apothecaries Pound and Ounce, and the Pound and Ounce Troy, are the same, only differently divided and subdivided.

CLOTH MEASURE.

			Marked
4 Nails	make	1 Quarter of a Yard	*n.* *qrs.*
3 Quarters		1 Flemish Ell	*F. E.*
4 Quarters		1 Yard	*yd.*
5 Quarters		1 English Ell	*E. E.*
6 Quarters		1 French Ell	*Fr. E.*

Inches.

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Inches.

$2\frac{1}{4}$ = 1 Nail.
9 = 4 = 1 Quarter.
36 = 16 = 4 = 1 Yard.
27 = 12 = 3 = 1 Flemiſh Ell.
45 = 20 = 5 = 1 Engliſh Ell.

LONG MEASURE.

			Marked
3 Barley Corns	make	1 Inch	*bar.* / *in.*
12 Inches		1 Foot	*feet.*
3 Feet		1 Yard	*yd.*
6 Feet		1 Fathom	*fth.*
$5\frac{1}{2}$ Yards		1 Rod, Pole, or Perch	*rod. p.*
40 Poles		1 Furlong	*fur.*
8 Furlongs		1 Mile	*mile.*
3 Miles		1 League	*lea.*
60 Miles		1 Degree	*deg.*

Barley Corns.

3 = 1 Inch.
36 = 12 = 1 Foot.
108 = 36 = 3 = 1 Yard.
594 = 198 = $16\frac{1}{2}$ = $5\frac{1}{2}$ = 1 Pole.
23760 = 7920 = 660 = 220 = 40 = 1 Furlong.
190080 = 63360 = 5280 = 1760 = 320 = 8 = 1 Mile.

N. B. A Degree is 69 Miles, 4 Furlongs, nearly, though commonly reckoned but 60 miles.

This Meaſure is uſed to Meaſure Diſtance of Places, or any thing elſe that hath Length only.

WINE MEASURE.

			Marked
2 Pints	make	1 Quart	*pt.* / *qts.*
4 Quarts		1 Gallon	*gal.*
10 Gallons		1 Anchor of Brandy	*anc.*
18 Gallons		1 Rundlet	*run.*
$31\frac{1}{2}$ Gallons		Half an Hogſhead	$\frac{1}{2}$*hhd.*
42 Gallons		1 Tierce	*tierce*
63 Gallons		1 Hogſhead	*hhd.*
2 Hogſheads		1 Pipe or Butt	*P.* or *Butt.*
2 Pipes or 4 Hogſheads		1 Tun	*tun.*

Inches.

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Inches.

$28\frac{7}{8}$ = 1 Pint.
$57\frac{1}{4}$ = 2 = 1 Quart.
231 = 8 = 4 = 1 Gallon.
9702 = 336 = 168 = 42 = 1 Tierce.
14553 = 504 = 252 = 63 = $1\frac{1}{2}$ = 1 Hogshead.
19404 = 672 = 336 = 84 = 2 = $1\frac{1}{3}$ = 1 Puncheon.
29106 = 1008 = 504 = 126 = 3 = 2 = $1\frac{1}{2}$ = 1 Pipe.
58212 = 2016 = 1008 = 252 = 6 = 4 = 3 = 2 = 1 Tun.

All brandies, spirits, perry, cyder, mead, vinegar, honey, and oil, are measured by this measure; as also milk: not by law, but custom only.

ALE *and* BEER MEASURE.

2 Pints	make	1 Quart	{ *Pts.* / *Qts.*
4 Quarts		1 Gallon	*Gal.*
8 Gallons		1 Firkin of Ale	*A fir.*
9 Gallons		1 Firkin of Beer	*B. fir.*
2 Firkins		1 Kilderkin	*Kil.*
4 Firkins, or 2 Kilderkins		1 Barrel	*Bar.*
1 Barrel and $\frac{1}{2}$, or 54 Gal.		1 Hogshead of Beer	*Hhd.*
2 Barrels		1 Puncheon	*Pun.*
3 Barrels, or 2 Hogsheads		1 Butt	*Butt.*

BEER.

Cubic Inches.

$35\frac{1}{4}$ = 1 Pint.
$70\frac{1}{2}$ = 2 = 1 Quart.
282 = 8 = 4 = 1 Gallon.
2538 = 72 = 36 = 9 = 1 Firkin.
5076 = 144 = 72 = 18 = 2 = 1 Kilderkin.
10152 = 288 = 144 = 36 = 4 = 2 = 1 Barrel.
15228 = 432 = 216 = 54 = 6 = 3 = $1\frac{1}{2}$ = 1 Hogshead.
20304 = 576 = 288 = 72 = 8 = 4 = 2 = 1 Puncheon.
30456 = 864 = 432 = 108 = 12 = 6 = 3 = 2 = 1 Butt.

ALE.

Cubic Inches.

$35\frac{1}{4}$ = 1 Pint.
$70\frac{1}{2}$ = 2 = 1 Quart.
282 = 8 = 4 = 1 Gallon.
2256 = 64 = 32 = 8 = 1 Firkin.
4512 = 128 = 64 = 16 = 2 = 1 Kilderkin.
9024 = 256 = 128 = 32 = 4 = 2 = 1 Barrel.
13536 = 384 = 192 = 48 = 6 = 3 = $1\frac{1}{2}$ = 1 Hogshead.

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In *London* they compute but 8 gallons to the firkin of ale, and 32 to the barrel; but in all other parts of England, for ale, ſtrong beer, and ſmall, 34 gallons to the barrel, and 8 gallons and ½ to the firkin.

N. B. A barrel of ſalmon or eels is - 42 gallons.
A barrel of herrings - - 32 gallons.
A keg of ſturgeon - - 4 or 5 gallons.
A firkin of ſoap - - 8 gallons.

DRY MEASURE.

				Marked
2 Pints -	make -	1 Quart -		*pts.* / *qts.*
2 Quarts -	- -	1 Pottle -		*pot.*
2 Pottles -	- -	1 Gallon -		*gal.*
2 Gallons -	- -	1 Peck -		*pk.*
4 Pecks -	- -	1 Buſhel -		*bu.*
2 Buſhels -	- -	1 Strike -		*ſtrike*
4 Buſhels -	- -	1 Coom -		*coom*
2 Cooms, or 8 Buſhels	-	1 Quarter -		*qr.*
4 Quarters	-	1 Chaldron		*chal.*
5 Quarters	- -	1 Wey -		*wey.*
2 Weys	- -	1 Laſt -		*laſt.*

In *London* 36 buſhels make a chaldron.

Solid Inches.

$268\frac{4}{5}$ = 1 Gallon.
$537\frac{3}{5}$ = 2 = 1 Peck.
$2150\frac{2}{5}$ = 8 = 4 = 1 Buſhel.
$4300\frac{4}{5}$ = 16 = 8 = 2 = 1 Strike.
$8601\frac{3}{5}$ = 32 = 16 = 4 = 2 = 1 Coom.
$17203\frac{1}{5}$ = 64 = 32 = 8 = 4 = 2 = 1 Quarter.
86016 = 320 = 160 = 40 = 20 = 10 = 5 = 1 Wey.
172032 = 640 = 320 = 80 = 40 = 20 = 10 = 2 = 1 Laſt.

The buſhel in *Water Meaſure* is 5 Pecks.

A ſcore of coals is 21 chaldron.
A ſack of coals - 3 buſhels.
A chaldron of coals - 12 ſacks.
A load of corn - - 5 buſhels.
A cart load of ditto - 43 buſhels.

This meaſure is applied to all dry goods.

The ſtandard buſhel is 18 inches and ½ wide, and 8 inches deep.

TIME.

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TIME.

			Marked
60 Seconds	make	1 Minute	″ / *m.*
60 Minutes		1 Hour	*hour.*
24 Hours		1 Day	*day.*
7 Days		1 Week	*week.*
4 Weeks		1 Month	*mo.*
13 Months, 1 day, 6 hours		1 Julian year	*yr.*

Seconds.

60= 1 Minute.
3600= 60= 1 Hour.
86400= 1440= 24= 1 Day.
604800=10080= 168= 7= 1 Week.
2419200=40320= 672=28= 4= 1 Month.

d h w d h
31557600=525960=8766=365.6=52.1.6=1 Julian year.
d h m. ″
31556937=525948=8765=365.5.48.57=1 Solar year.

To know the days in each month, observe,

Thirty days hath September,
April, June, *and* November:
February *hath twenty-eight alone,*
All the rest have thirty and one;
Except in Leap-Year, *and then's the time,*
February's *days are twenty and nine.*

SQUARE MEASURE.

144 Inches	make	1 Foot.
9 Feet		1 Yard.
100 Feet		1 Square of flooring.
272¼ Feet		1 Rod.
40 Rods		1 Rood.
4 Roods, or 160 Rods, or 4840 yds.		1 Acre of land.
640 Acres		1 Square mile.
30 Acres		1 Yard of land.
100 Acres		1 Hide of land.

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Inches.

144= 1 Foot.
1296= 9 = 1 Yard.
39204= 272¼= 30¼= 1 Pole.
1568160=10890 =1210 = 40=1 Rood.
6272640=43560 =4840 =160=4=1 Acre.

By this meaſure are meaſured all things that have length and breadth; ſuch as land, painting, plaſtering, flooring, thatching, plumbing, glazing, &c.

SOLID MEASURE.

1728 Inches make 1 Solid Foot.
27 Feet - 1 Yard, or load of earth.
40 Feet of round timber } is 1 Ton or load.
Or, 50 Feet of hewn timber }

108 ſolid feet, *i. e.* 12 feet in length, 3 feet in breadth, and 3 deep, or, commonly, 14 feet long, 3 feet 1 inch broad, and 3 feet 1 inch deep, is a ſtack of wood.

128 ſolid feet, *i. e.* 8 feet long, 4 feet broad, and 4 feet deep, is a cord of wood.

By this meaſure are meaſured all things that have length, breadth, and depth.

ADDITION *of* MONEY, WEIGHTS, *and* MEASURES.

RULE. Add the firſt row or denomination together as in integers; then divide the ſum by as many of the ſame denomination as makes one of the next greater, ſetting down the remainder under the row added, and carry the quotient to the next ſuperior denomination, continuing the ſame to the laſt, which add as in ſimple Addition.

MONEY.

£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
2	13	5½	27	7	2	35	17	3	75	3	7
7	9	4¼	34	14	7¼	59	14	7½	54	17	1½
5	15	4½	57	19	2¼	97	13	5¼	91	15	4¼
9	17	6¼	91	16	1	37	16	8¼	35	16	5¾
7	16	3	75	18	7¼	97	15	7	29	19	7¼
5	14	7¼	97	13	5	59	16	5½	91	17	3¼
39	6	7¼									

MONEY.

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MONEY.

£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
257	1	5½	525	2	4¼	21	14	7¼	73	2	1½
734	3	7¼	179	3	5	75	16	0	25	12	7
595	5	3	250	4	7¼	79	2	4¼	96	13	5½
159	14	7½	975	3	5¼	57	16	5½	76	17	3¼
207	5	4	254	5	7	26	13	8¼	97	1	1
798	16	7¼	379	4	5¼	54	2	7	54	11	7¾
127	4	7½	261	17	1¼	31	1	1½	27	13	5
525	3	5	379	13	5	75	13	1	16	7	9¾
271	0	5	257	16	7¼	39	19	7¼	9	15	3
524	9	1	184	13	5	97	17	3¼	15	2	7¾
379	4	3½	725	2	3¼	36	13	5	37	19	1
215	5	8¾	359	6	5	24	16	3¼	56	19	1¾

TROY WEIGHT.

oz.	dwt.	gr.	oz.	dwt.	gr.	lb.	oz.	dwt.	lb.	oz.	dwt.
7	15	21	5	11	4	7	1	2	5	2	15
8	17	6	7	19	21	3	2	17	3	11	17
2	5	15	3	15	14	5	1	15	3	7	15
3	16	19	7	19	22	7	10	11	9	1	13
9	18	23	9	18	15	2	7	13	3	9	7
7	15	14	8	13	12	3	11	16	5	2	15

AVOIRDUPOISE WEIGHT.

lb.	oz.	dr.	lb.	oz.	dr.	cwt.	qrs.	lb.	t.	cwt.	qrs.
152	15	15	17	12	3	25	1	17	7	17	2
272	14	10	23	15	6	72	3	26	5	5	3
303	15	11	31	11	14	54	1	16	2	4	1
255	10	4	97	0	9	24	1	16	3	18	2
173	6	2	48	7	15	17	0	19	7	9	3
635	13	13	79	10	6	55	2	16	8	5	1

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APOTHECARIES WEIGHT.

℥	℈	*gr.*	℔	℥	℈	*gr.*	℔	℥	℈	℔	℥	℈
7	1	17	9	2	0	17	7	10	7	1	7	2 1 0
3	0	18	3	5	2	19	9	5	2	2	3	1 7 1
6	2	16	9	2	1	14	7	11	1	2	9	10 2 0
5	1	15	3	5	0	18	9	5	6	1	7	5 7 1
7	0	18	7	7	2	15	7	10	5	2	3	9 5 2
3	1	9	3	3	0	—	9	—	7	0	7	1 4 1

CLOTH MEASURE.

FF.	*qrs.*	*n.*	*yds.*	*qrs.*	*n.*	*yds.*	*qrs.*	*n.*	*EE.*	*qrs.*	*n.*
27	2	1	35	3	3	73	3	2	72	2	1
15	1	3	70	2	2	97	1	3	52	1	2
37	0	2	95	3	0	54	0	2	79	0	1
52	1	3	76	1	3	76	2	0	56	2	0
76	2	1	26	0	1	59	1	3	79	3	1
97	1	3	79	2	1	76	2	2	54	2	1

LONG MEASURE.

feet.	*in.*	*bar.*	*yds.*	*feet.*	*in.*	*m.*	*fur.*	*p.*	*lea.*	*m.*	*fur.*
27	9	2	25	1	9	35	7	3	72	2	1
35	10	1	71	0	3	27	5	27	27	1	7
17	2	0	52	2	3	52	0	35	35	2	5
85	11	1	97	0	10	97	1	17	79	0	6
97	2	2	54	2	7	56	7	18	51	1	6
54	8	1	37	1	4	91	5	27	72	0	5

LAND MEASURE.

a.	*r.*	*p.*	*a.*	*r.*	*p.*	*a.*	*r.*	*p.*	*a.*	*r.*	*p.*
75	3	27	27	1	35	26	1	31	32	1	14
36	2	15	29	2	19	19	2	17	27	0	19
97	1	16	37	1	15	55	3	14	31	2	15
35	2	15	95	2	27	79	1	21	19	1	18
27	1	14	62	0	13	95	2	14	59	2	17

WINE

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WINE MEASURE.

run.	*gal.*	*qts.*	*tier.*	*gal.*	*qts.*	*hhds.*	*gal.*	*qts.*	*T.*	*hhds.*	*gal.*
27	17	2	25	36	2	31	57	1	14	3	27
35	15	3	75	41	2	97	18	2	19	2	56
56	14	1	62	15	1	76	13	1	17	0	39
97	10	3	94	13	2	55	46	2	75	2	16
92	15	—	15	14	3	87	38	3	54	1	19
79	3	1	19	17	1	55	17	1	97	3	54

ALE and BEER MEASURE.

A.B.	*fir.*	*gal.*	*B.B.*	*fir.*	*gal.*	*hhd.*	*gal.*	*qt.*	*hhd.*	*gal.*	*qt.*
25	2	7	37	2	8	76	51	2	76	2	1
17	3	5	51	1	7	57	3	3	95	35	2
96	2	6	97	3	8	97	27	3	57	16	3
75	1	4	78	2	5	22	17	2	22	14	1
96	3	7	47	0	7	32	19	3	32	37	3
75	0	5	35	2	5	55	38	0	55	16	1

DRY MEASURE.

qr.	*bu.*	*p.*	*qr.*	*bu.*	*p.*	*ch.*	*bu.*	*p.*	*ch.*	*bu.*	*p.*
75	7	2	36	2	1	75	27	2	73	2	1
37	2	3	71	0	3	57	3	1	41	24	1
51	2	0	53	6	0	95	25	3	92	16	1
79	7	1	82	4	1	76	35	2	70	13	2
55	0	3	95	3	3	97	25	1	54	17	3
96	2	1	78	2	2	75	16	3	79	25	1

TIME.

hs.	*m.*	*".*	*d.*	*h.*	*m.*	*w.*	*d.*	*h.*	*w.*	*d.*	*h.*
52	57	35	72	23	27	71	3	11	57	2	15
97	16	27	54	15	35	51	2	9	95	3	21
16	51	54	67	13	31	76	0	21	76	0	15
96	18	31	58	21	45	95	3	21	53	2	21
75	35	21	96	20	48	79	1	15	98	2	18

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The APPLICATION.

1. A man born in the year 1750, when will he be 47 years of age? *Anſ.* 1797

2. *A*, *B*, *C*, *D*, went partners in the purchaſe of a quantity of goods; *A* laid out £7. half a guinea and a crown, *B* 49*s.* *C* 54*s.* 6*d.* and *D* 87*d.* What was laid out in all? *Anſ.* £13..6..3.

3. A man lent his friend at different times theſe ſeveral ſums, *viz.* £63, £25..15, £32..7, £15..14..10, and four-ſcore and nineteen pounds, half a guinea and a ſhilling. How much did he lend in all? *Anſ.* £236..8..4.

4. What's the eſtate worth *per annum*, when the taxes are 21 guineas, the neat income 8 ſcore, and £19..14? *Anſ.* £201..15.

5. There are three numbers; the firſt 215, the ſecond 519, and the third is as much as the other two. What is the ſum of them all? *Anſ.* 1468.

6. Bought a parce of goods, for which I paid £54..17, for packing 13*s.* 8*d.* cariage £1..5..4, and ſpent about the bargain 14*s.* 3*d.* What do theſe goods ſtand me in? *Anſ.* £57..10..3.

7. There are two numbers, the leaſt whereof is 40, their difference 14. I deſire to know what is the greater number, and the ſum of both? *Anſ.* 54 *greater number*, 94 *ſum.*

8. A gentleman left his eldeſt daughter £1500 more than the youngeſt, and her fortune was 11 thouſand, 11 hundred and £11. What was the eldeſt ſiſter's fortune, and what did the father leave them?

Anſ. Eldeſt ſiſter's fortune £13611. *Father left them* £25722.

9. A nobleman, before he went out of town, was deſirous of paying all his tradeſmens bills, and upon enquiry he found, that he owed 82 guineas for rent; to his wine-merchant £72..5; to his confectioner £12..13..4; to his draper £47..13..2; to his taylor £110..15..6; to his coach-maker £157..8; to his tallow-chandler £8..17..9; to his corn-chandler £170..6..8; to his brewer £52..17; to his butcher £122..11..5; to his baker £37..9..5; and to his ſervants for wages £53..18. I deſire to know what money he had to raiſe in the whole, when we add to the above ſums £100. which he wiſhed to take with him? *Anſ.* £1037..17..3.

10. A father was 24 years of age, (allowing 13 months to a year, and 28 days to a month) when his firſt child was born; between the eldeſt and next born was 1 year, 11 months, and 14 days; between the ſecond and third were 2

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years, 1 month, and 15 days; between the third and fourth were two years, 10 months, and 25 days; when the fourth was 27 years, 9 months, and 12 days old, how old was the father? *Anſ. Years* 58..7..10.

11. A banker's clerk, having been out with bills, brings home an account, that A paid him £7..5..2 B £15..18..6½. C £.150..13..2¼ D £17..6..8. E 5 guineas, 2 crown pieces, 4 half crowns, and 4*s.* and 2*d.* F paid him only 20 groats, G £76..15..9½. and H £121..12..4. I deſire to know how much the whole amounted to that he had to pay?

Anſ. £396..7..6¼.

12. A nobleman had a ſervice of plate, which conſiſted of twenty diſhes, weighing 203 *oz.* 8 *dwts.*; thirty-ſix plates, weighing 408 *oz.* 9 *dwts.*; five dozen of ſpoons, weighing 112 *oz.* 7 *dwts.*; ſix ſalts and ſix pepper-boxes, weighing 71 *oz.* 8 *dwts.*; knives and forks, weighing 73 *oz.* 5 *dwts.*; two large cups, a tankard, and a mug, weighing 121 *oz.* 4 *dwts.*; a tea-kettle and lamp, weighing 131 *oz.* 7 *dwts.*; together with ſundry other ſmall articles, weighing 105 *oz.* 5 *dwts.* I deſire to know the weight of the whole?

Anſ. 1102 *lb.* 2 *oz.* 18 *dwts.*

13. A hop-merchant buys five bags of hops, of which the firſt weighed 2 *Cwt.* 3 *qrs.* 13 *lb.*; the ſecond 2 *Cwt.* 2 *qrs.* 11 *lb.*; the third 2 *Cwt.* 3 *qrs.* 5 *lb.*; the fourth 2 *Cwt.* 3 *qrs.* 12 *lb.*; the fifth 2 *Cwt.* 3 *qrs.* 15 *lb.* Beſides theſe, he purchaſed two pockets, each weighing 84 *lb.* I deſire to know the weight of the whole? *Anſ.* 15 *Cwt.* 2 *qrs.*

14. A, of Vienna, owes to B, of Liverpool, for goods received in January, the ſum of £103..12..2.; for goods received in February, £93..3..4.; for goods received in March £121..17.; for goods received in April £142..15..4; for goods received in May £171..15..10.; for goods received in June £142..12..6.; but the latter ſix months of the year, owing to the falling off in the demands for the articles in which he dealt, amounted to the ſum only of £205..7..2.. I deſire to know the amount of the whole year's bill? *Anſ.* £981..3..4.

SUBTRACTION *of* MONEY, WEIGHTS, *and* MEASURES.

RULE. Subtract as in Integers: only when any of the lower denominations are greater than the upper, borrow as many of that as make one of the next ſuperior, adding it to the upper, from which take the leſs; ſet down the difference, and carry 1 to the next higher denomination for what you borrowed.

PROOF. As in Integers.

MONEY.

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MONEY.

	£.	s.	d.		£.	s.	d.
Borrowed	715 ..	2 ..	7¼	Lent	316 ..	3 ..	5½
Paid	476 ..	3 ..	8½	Received	218 ..	2 ..	1¾
Remains to pay	238 ..	18 ..	10¾				

Proof 715 .. 2 .. 7¼

£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
87 ..	2 ..	10	3 ..	15 ..	1½	25 ..	2 ..	5¼	37 ..	3 ..	4¼
79 ..	3 ..	7½	1 ..	14 ..	7	17 ..	9 ..	8½	25 ..	5 ..	2¼

£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
821 ..	17 ..	1½	59 ..	15 ..	3¼	71 ..	2 ..	4	527 ..	3 ..	5¼
257 ..	14 ..	7	36 ..	17 ..	2½	19 ..	13 ..	7¼	139 ..	5 ..	7½

Borrowed	25107 ..	15 ..	7	Lent	250156 ..	1 ..	6
	375 ..	5 ..	5¼		271 ..	13 ..	7½
Paid	259 ..	2 ..	7½	Received	359 ..	15 ..	3
at	359 ..	13 ..	4¼	at	475 ..	13 ..	9½
different	523 ..	17 ..	8	several	527 ..	15 ..	3¾
times	274 ..	15 ..	7¼	payments	272 ..	16 ..	5
	325 ..	13 ..	5		150 ..	— ..	0
Paid in all							
Remains to pay							

TROY WEIGHT.

	oz.	dt.	gr.	oz.	dt.	gr.	lb.	oz.	dt.	gr.	lb.	oz.	d.	gr.
Bought	27 ..	15 .	2	7 ..	5 ..	15	52 ..	1 ..	7 ..	2	7 ..	2 ..	2 ..	5
Sold	21 ..	14 ..	7	6 ..	7 ..	14	39 ..	0 ..	15 ..	7	5 ..	7 ..	1 ..	7
Unfold														

AVOIRDUPOISE WEIGHT.

lb.	oz.	dr.	lb.	oz.	dr.	cwt.	qrs.	lb.	T.	cwt.	qrs.	lb.
25 ..	11 ..	15	35 ..	10 ..	5	35 ..	1 ..	21	21 ..	1 ..	2 ..	7
17 ..	9 ..	13	29 ..	12 ..	7	25 ..	1 ..	20	9 ..	1 ..	3 ..	5

APOTHE-

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APOTHECARIES WEIGHT.

℈	℥	ʒ	*gr.*	℥	ʒ	℈	*gr.*	℔	℥	ʒ	℈	℔	℥	ʒ	℈
27	1	0	1	3	1	2	4	5	2	1	0	9	7	2	1
15	2	0	7	1	0	0	7	2	5	2	1	5	7	3	1

CLOTH MEASURE.

EF	*qrs.*	*n.*	*yds.*	*f.*	*in.*	*yds.*	*qrs.*	*n.*	*EE.*	*qrs.*	*n.*
35	2	2	47	1	0	71	1	2	35	2	1
17	2	1	35	2	2	3	2	1	14	3	2

LONG MEASURE.

f.	*in.*	*bar.*	*yds.*	*f.*	*in.*	*m.*	*fur.*	*p.*	*l.*	*m.*	*f.*	*p.*
25	1	0	37	2	1	52	1	27	71	1	7	—
17	0	2	15	2	7	25	7	34	50	0	3	27

LAND MEASURE.

a.	*r.*	*p.*	*a.*	*r.*	*p.*	*a.*	*r.*	*p.*	*a.*	*r.*	*p.*
75	1	27	37	1	27	25	0	1	325	2	1
59	0	27	35	2	15	17	1	0	279	3	5

WINE MEASURE.

tun.	*gal.*	*qts.*	*tier.*	*gal.*	*qts.*	*hhd.*	*gal.*	*qts.*	*hhd.*	*gal.*	*qts.*
72	1	1	27	27	1	75	57	1	79	2	14
35	1	2	19	35	2	57	59	1	35	5	27

ALE *and* BEER MEASURE.

25 .. 1 .. 2	37 .. 2 .. 1	27 .. 27 .. 1	709 .. 2 .. 1
21 .. 1 .. 5	25 .. 1 .. 7	12 .. 50 .. 2	157 .. 2 .. 2

DRY MEASURE.

qu.	*bu.*	*p.*	*qu.*	*bu.*	*p.*	*ch.*	*bu.*	*p.*	*ch.*	*bu.*	*p.*
72	1	2	65	2	1	79	3	0	35	3	3
35	2	3	57	2	3	54	7	1	23	5	1

TIME.

h.	*m.*	*".*	*d.*	*h.*	*m.*	*m.*	*w.*	*d.*	*m.*	*w.*	*d.*
75	1	27	72	1	51	35	2	1	65	2	1
52	7	31	36	3	27	17	3	5	14	1	1

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The APPLICATION.

1. A man born in the year 1723, what was his age in the year 1781? *Anſ.* 58.

2. What is the difference between the age of a man born in 1710, and another born in 1766? *Anſ.* 56.

3. A merchant had five debtors, *A*, *B*, *C*, *D*, and *E*; which together owed him £1156; *B*, *C*, *D*, and *E*, owed him £737. What was *A*'s debt? *Anſ.* £419.

4. When an eſtate of £300 *per annum* is reduced, on paying of taxes, to 12 ſcore and £14..6: What is the tax?
Anſ. £45..14.

5. What is the difference between 9154, and the amount of 754 added to 305. *Anſ.* 8095.

6. A horſe in his furniture is worth £37..5; out of it, 14 guineas: How much does the price of the furniture exceed that of the horſe? *Anſ.* £7..17.

7. A merchant, at his out-ſetting in trade, owed £750; he had in caſh, commodities, the ſtocks, and good debts, £12510..7; he cleared the firſt year by commerce, £452..3..6: What is the neat balance at the 12 months end?
Anſ. £12212..10..6.

8. A gentleman dying left £45247, between two daughters; the youngeſt was to have 15 thouſand, 15 hundred, and twice £15: What was the eldeſt ſiſter's fortune?
Anſ. £28717.

9. *A*, *B*, *C*, and *D*, ſent their money to the bankers, and drew upon them in this manner: Jan. 3, 1788, *A* ſent in £152..12; *B* had £132..15..2 good in the bankers' hands, and on the 10th ſent in £52..12..6 more; *C*, after taking out £100. found he had left in the bankers' hands £173..8..4, and on the 6th added £175 to his ſtock. The day following, *D* made up his ſtock £172..12..6, and on the 10th drew for £121..6..2. On the 12th *A* drew for £119..12..3, and ſent in good bills to the amount of £171..11..5. The ſame day *B* drew for £142..14..6, as did *C* for £205..10. On the 20th *D* ſent in £128..12..4, and the next day drew for £93..15..2. On the 30th they drew 20 guineas each, and in the afternoon ſent in 30 guineas each. I deſire to know how their accounts ſtood ſeparately with the bankers.

Anſ. A had left in the bankers' hands £215..1..2.
B £53..3..2. *C* £153..8..4. *D* £96..13..6.

10. A tradeſman happening to fail in buſineſs, called all his

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his creditors together, and found he owed to *A* £53..7..6; to *B* £105..10; to *C* £34..5..2; to *D* £28..16..5; to *E* £14..15..8; to *F* £112..9; and to *G* £143..12..9. His creditors found the value of his ſtock to be £212..6; and that he had owing him in good book debts £112..8..3; beſides £21..10..5, money in hand. As his creditors took all his effects into their hands, I deſire to know, whether they were loſers or gainers, and how much?

Anſ. The creditors loſt £146..1..10.

11. My correſpondent at Seville, in Spain, ſends me the following account of money received at different ſales for goods ſent him by me, viz. Bees-wax to the value of £37..15..4: ſtockings £37..6..7; tobacco £125..11..6; linen cloth £112..14..8; tin £115..10..5. My correſpondent at the ſame time informs me, that he has ſhipped, agreeable to my order, wines to the value of £250..15; fruit to the value of £51..12..6; figs 19..17..6; oil £19..12..4; and Spaniſh wool to the value of £115..15..6. I deſire to know how the account ſtands between us, and who is the debtor?

Anſ. Due to my Spaniſh correſpondent £26..14..4.

12. My grandfather is 112 years of age, and my father juſt 64. I am not ſo old as my grandfather by 82 years. What is the difference in years between me and my father?

Anſ. 34 *Years.*

13. What is the difference between the ages of *A*, born in the year 1693, and *B*, who will be born 15 years hence, the queſtion being put in 1788? *Anſ.* 110 *years.*

MULTIPLICATION *of ſeveral* DENOMINATIONS.

RULE. Multiply the firſt denomination by the quantity given, dividing the product by as many of that as make one of the next, ſetting down the remainder, and add the quotient to the next ſuperior, after it is multiplied.

If the given quantity is above 12, multiply by any two numbers, which multiplied together, will make the ſame number; but if no two numbers multiplied together will make the exact number, then multiply the top line by as many as is wanting, adding it to the laſt product.

PROOF. By Diviſion.

£. s. d.	£. s. d.	£. s. d.	£. s. d.
35..12..7¼	75..13..1½	62..5..4¼	57..2..4¾
2	3	4	5
71..5..2½			

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lb. oz. dwts. gr.	*ton, cwt. qrs. lb.*	*yds. qrs. n.*	*m. fur. p.*
8 .. 5 .. 17 .. 4	25 .. 7 .. 2 .. 1	76 .. 1 .. 2	36 .. 7 .. 5
7	8	2	5

a. r. p.	*A.B. fir. gal.*	*B.B. fir. gal.*	*m. fur. p.*
7 .. 2 .. 1	32 .. 1 .. 7	26 .. 2 .. 7	54 .. 2 .. 1
9	7	3	5

1. 18yds. of cloth at 9*s.* 6*d.* *per* yd.

9×2=18

	9
4 .. 5 .. 6	
	2
8 .. 11 .. 0	

2. 26lb. of tea, at £1 .. 2 .. 6 *per* lb.

8×3+2=26

	8
9 .. 0 .. 0	
	3
27 .. 0 .. 0	
Top line × 2	2 .. 5 .. 0
29 .. 5 .. 0	

3. 21 ells of holland, at 7*s.* 8$d\frac{1}{2}$ *per* ell.
Facit £ 8 .. 1 .. 10$\frac{1}{2}$.

4. 85 firkins of butter, at 15*s.* 3$d\frac{1}{2}$ *per* firkin.
Facit £ 26 .. 15 .. 2$\frac{1}{2}$

5. 75lb. of nutmegs, at 7*s.* 2$d\frac{1}{4}$ *per* lb.
Facit £27 .. 2 .. 2$\frac{1}{4}$.

6. 37 yards of tabby, at 9*s.* 7*d.* *per* yard.
Facit £17 .. 14 .. 7.

7. 97 cwt. of cheese, at 1*l.* 5*s.* 3*d.* *per* cwt.
Facit £122 .. 9 .. 3.

8. 43 dozen of candles, at 6*s.* 4*d.* *per* dozen.
Facit £13 .. 12 .. 4

9. 127 lb. of bohea tea, at 12*s.* 3*d.* *per* lb.
Facit £77 .. 15 .. 9.

10. 135 gallons of rum, at 7*s.* 5*d.* *per* gallon.
Facit £50 .. 1 .. 3.

11. 74 ells of diaper, at 1*s.* 4$d\frac{1}{2}$ *per* ell.
Facit £ 5 .. 1 .. 9.

12. 6 dozen pair of gloves, at 1*s.* 10*d.* *per* pair.
Facit £ 6 .. 12 .. 0.

When the given quantity consists of $\frac{1}{2}$, $\frac{1}{4}$, divide the price by $\frac{1}{2}$, $\frac{1}{4}$; when $\frac{3}{4}$, divide the price by $\frac{1}{4}$, and that quotient by $\frac{1}{2}$; which add to the product of the quantity given.

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13. $25\frac{1}{2}$ ells of holland, at 3*s.* $4\frac{1}{2}$*d per.* ell.

5 $5\frac{1}{2} \times 5 + \frac{1}{2} = 25\frac{1}{2}$

16 .. $10\frac{1}{2}$
5

4 .. 4 .. $4\frac{1}{2}$ = 25
0 .. 1 .. $8\frac{1}{2}$ = $\frac{1}{2}$

4 .. 6 .. $0\frac{1}{2}$ = $25\frac{1}{2}$

14. $75\frac{1}{2}$ ells of diaper, at 1*s.* 3*d. per* ell.
Facit £4 .. 14 .. $4\frac{1}{2}$.

15. $19\frac{1}{2}$ ells of damask, at 4*s.* 3*d. per* ell.
Facit £4 .. 2 .. $10\frac{1}{2}$.

16. $35\frac{1}{2}$ ells of dowlas, at 1*s.* 4*d. per* ell.
Facit £2 .. 7 .. 4.

17. $7\frac{1}{4}$ cwt. of Malaga raisins, at 1*l.* 1*s.* 6*d. per* cwt.
Facit £7 .. 15 .. $10\frac{1}{2}$.

18. $6\frac{1}{2}$ barrels of herrings, at 3*l.* 15*s.* 7*d. per* barrel.
Facit £24 .. 11 .. $3\frac{1}{2}$.

19. $35\frac{3}{4}$ cwt. of double refined sugar, at 4*l.* 15*s.* 6*d. per* cwt.
Facit £169 .. 10 .. 3.

20. $154\frac{1}{2}$ cwt. of tobacco, at 4*l.* 17*s.* 10*d. per* cwt.
Facit £755 .. 15 .. 3.

21. $117\frac{3}{4}$ gallons of arrack, at 12*s.* 6*d. per* gallon.
Facit £73 .. 5 .. $7\frac{1}{2}$.

22. $85\frac{3}{4}$ cwt. of cheese, at 1*l.* 7*s.* 8*d. per* cwt.
Facit £118 .. 12 .. 5.

23. $29\frac{1}{4}$ lb. of fine Hyson tea, at 1*l.* 3*s.* 6*d. per* lb.
Facit £34 .. 7 .. $4\frac{1}{2}$.

24. $17\frac{3}{4}$ yards of superfine scarlet drab, at 1*l.* 3*s.* 6*d. per* yd.
Facit £20 .. 17 .. $1\frac{1}{2}$.

25. $37\frac{1}{2}$ yards of rich brocaded silk, at 12*s.* 4*d. per* yard.
Facit £23 .. 2 .. 6.

26. $56\frac{3}{4}$ cwt. of sugar, at 2*l.* 18*s.* 7*d. per* cwt.
Facit £166 .. 4 .. $7\frac{1}{4}$.

27. $96\frac{1}{2}$ cwt. of currants, at 2*l.* 15*s.* 6*d. per* cwt.
Facit £267 .. 15 .. 9.

28. $45\frac{3}{4}$ lb. of Belladine silk, at 18*s.* 6*d. per* lb.
Facit £42 .. 6 .. $4\frac{1}{2}$.

29. $87\frac{3}{4}$ bushels of wheat, at 4*s.* 3*d. per* bushel.
Facit £18 .. 12 .. $11\frac{1}{4}$.

30. $120\frac{1}{4}$ cwt. of hops, at 4*l.* 7*s.* 6*d.* per cwt.
Facit £528 .. 5 .. $7\frac{1}{2}$.

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The APPLICATION.

1. What ſum of money muſt be divided amongſt 18 men, ſo that each may receive £14..6..8½?

Anſ. £258..0..9.

2. A privateer of 250 men took a prize, which amounted to £125..15..6 to each man, what was the value of the prize?

Anſ. £31443..15..0.

3. What is the difference between ſix dozen dozen and half a dozen dozen; and what is their ſum and product?

Anſ. 792 *Diff. Sum* 936, *Product* 62208.

4. What difference is there between twice eight and fifty, and twice fifty-eight, and what's their product?

Anſ. 50 *Diff.* 7656 *Prod.*

5. There are two numbers, the greater of them is 37 times 45, and their difference 19 times 4; their ſum and product are required?

Anſ. 3254 *Sum*, 2645685 *Prod.*

6. The ſum of two numbers is 360, the leſs of them 144; what is their product, and the ſquare of their difference?

Anſ. 31104 *Product*, 5184 *Square of their difference.*

7. In an army, conſiſting of 187 ſquadrons of horſe, each 158 men, and 207 battalions, each 560 men, how many effective ſoldiers, ſuppoſing that in ſeven hoſpitals there are 473 ſick? *Anſ.* 144806.

8. What ſum did that gentleman receive in dowry with his wife, whoſe fortune was her wedding ſuit: her petticoat having two rows of furbelows, each furbelow 87 quills, and in each quill 21 Guineas?

Anſ. £3836..14..0.

9. A merchant had £19118 to begin trade with; for 5 years together he cleared £1086 a year; the next 4 years he made good £2715..10..6 a year; but the laſt 3 years he was in trade had the misfortune to loſe, one year with another, £475..4..6 a year; what was his real fortune at 12 years end? *Anſ.* 33984..8..6.

10. In ſome parts of the kingdom they weigh their coals by a machine, in the nature of a ſteelyard, waggon and all. Three of theſe draughts together amount to 137 *cwt.* 2 *qrs.* 10 *lb.* and the tare or weight of the waggon 13 *cwt.* 1 *qr.* How many coals had the cuſtomer in twelve ſuch draughts? *Anſ.* 391 *cwt.* 1 *qr.* 12 *lb.*

11. A

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11. A certain gentleman lays up every year £294..12..6. and ſpends daily £1..12..6. I deſire to know what is his annual income? *Anſ.* £887..15.

12. A tradeſman gave to his daughter as a marriage portion a ſcrutore, in which were twelve drawers, in each drawer were ſix diviſions, and in each diviſion there were £50. four crown pieces, and eight half crowns pieces. How much had ſhe to her fortune? *Anſ.* £3744.

13. Admitting that I pay eight guineas and half a crown for a quarter's rent, and am allowed quarterly 15*s.* for trifling repairs, what does my apartment coſt me annually, and how much in ſeven years?

Anſ. In one year £31..2. *In ſeven* £217..14.

14. A robbery being committed on the highway, an aſſeſſment was made on a neighbouring hundred for the ſum of £386..15..6. of which four pariſhes paid each £37..14..2. four hamlets £31..4..2. each, and the four townſhips £18..12..6. each. How much was the deficiency?

Anſ. £36..12..2.

15. A gentleman at his deceaſe left his widow £4560.; to a public charity he bequeathed £572..10. to each of his four nephews £750..10.; to each of his four nieces £375..12..6.; to 30 poor houſekeepers ten guineas each, and 150 guineas to his executor. What ſum muſt he have been poſſeſſed of at the time of his death to anſwer all theſe legacies? *Anſ.* £10107..10.

16. Admit 20 to be remainder of a diviſion ſum, 423 the quotient, the diviſion the ſum of both, and 19 more. What was the number of the dividend? *Anſ.* 19544.6.

DIVISION *of ſeveral* DENOMINATIONS.

RULE. Divide the firſt Denomination on the left hand; and, if any remains, multiply them by as many of the next leſs as make one of that, which add to the next, and divide as before.

PROOF. By Multiplication.

£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
2)25	.. 2	.. 4	3)37	.. 7	.. 7	4)57	.. 5	.. 7	5)52	.. 7	.. 0
12	.. 11	.. 2									

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lb. oz. dwt. gr.	*lb. oz. dr.*	*T. cwt. qrs. lb.*
7)75 .. 3 .. 7 .. 3	8)35 .. 14 .. 13	6)5 .. 10 .. 1 .. 13
yds. qrs. n.	*m. f. p.*	*yds. ft. inch.*
11)35 .. 1 .. 3	9(76 .. 3 .. 27	12)75 .. 2 .. 9
A.B. fir. gal.	*A.B. fir. gal.*	*ch. bu. pk.*
12)35 .. 2 .. 5	9)55 .. 3 .. 7	11)357 .. 2 .. 1

The APPLICATION.

1. If a man ſpends £257::2::5 in 12 month's time, what is that *per* month? *Anſ.* £21..8..6¾.

2 The cloathing of 35 charity boys came to £57..3..7. What is the expence of each? *Anſ.* £1..12..8.

3. If I give £37::6::4¾ for nine pieces of cloth, what did I give *per* piece? *Anſ.* £4..2..11.

4. If 20 cwt of tobacco came to £27::5::4½, at what rate is that *per* cwt? *Anſ.* £1..7..3.

5. What is the value of 1 hogſhead of beer, when 120 are ſold for £154::17::10? *Anſ.* £1..5..9¾.

6 Bought 72 yards of cloth for £85::6::0, I deſire to know at what rate *per* yard? *Anſ.* £1..3..8¾.

7. Gave £275::3::4 for 36 bales of cloth. What is that for 2 bales? *Anſ.* £15..5..8¾.

8. A prize of £7257::3::6, is to be equally divided amongſt 500 ſailors. What is each man's ſhare? *Anſ.* £14..10..3¾.

9. There are 2545 bullocks to be divided among 509 men. I deſire to know how many each man had, and the value of each man's ſhare, ſuppoſing every bullock worth £9..14..6? *Anſ.* 5 *bullocks each man,* £48..12..6 *each ſhare.*

10. A gentleman has a garden walled in, containing 9625 yards; the breadth was 35 yards. What was the length? *Anſ.* 275.

11. A club in London, conſiſting of 25 gentlemen, joined for a lottery ticket of £10. value, which came up a prize of £4000. I deſire to know what each man contributed, and what each man's ſhare came to? *Anſ. each contributed* 8*s. each ſhare* £160.

12. A trader cleared £1156, equally in 17 years. How much did he lay by in a year? *Anſ.* £68.

13 Another cleared £2805, in 7½ years. What was his yearly increaſe of fortune? *Anſ.* £374.

14. What

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14. What number added to the 43 part of 4429 will raise it to 240? *Ans.* 137.

15. Divide 20s. between A, B, and C, in such sort that A may have 2s. less than B, and C 2s. more than B.

Ans. A 4s. 8d. B 6s. 8d. C 8s. 8d.

16. If there are a 1000 men to a regiment, and but 50 officers, how many private men are there to one officer?

Ans. 19.

17. What number is that which multiplied by 7847 will make the product 3013248? *Ans.* 384.

18. The quotient is 1083, the divisor 28604, what was the dividend, if the remainder came out 1788? *Ans.* 30979920.

19. An army, consisting of 20,000 men, took and plundered a city of 12,000l. What was each man's share, the whole being equally divided among them? *Ans.* 12s.

20. My purse and money, said Dick to Harry, are worth 12s. 8d. but the money is worth seven times the purse. What did the purse contain? *Ans.* 11s. 1d.

21. A merchant bought two lots of tobacco, which weighed 12*cwt.* 3*qrs.* 15*lb.* for 14*l.* 15*s.* 6*d.* Their difference in point of weight was 1*cwt.* 2*qrs.* 13*lb.* and of price 7*l.* 15*s.* 6*d.* I desire to know their respective weights and value?

Ans. Lesser weight 5*cwt.* 2*qrs.* 15*lb.* *Price* 53*l.* 10*s.*
Greater weight 7*cwt.* 1*qr.* *Price* 61*l.* 5*s.* 6*d.*

22. The Spectator mentions a club of fat people, whose number was only fifteen, and yet weighed no less than three tons. What was the weight of each person. *Ans.* 4*cwt.*

23. Five auditors in a public office receive ten pounds a quarter, for which they attend seven times during that period; but, if one more of them be absent at any time, then the absent persons shares are divided among those who attend. A and B never miss attendance on these occasions; but C and D are generally absent twice in a quarter, and E once. When the payment comes due, I wish to know what each has to receive?

Ans. A £2::9::0$\frac{4}{7}$. B £2::9::0$\frac{7}{4}$. C £1::10::0.
D £1::10::0. E £2::1::10$\frac{6}{7}$.

24. Divide 1000 crowns in such a manner between A, B, and C, that A may receive 129 more than B, and B 178 less than C. *Ans.* A 360, B 231, C, 409.

25. A young fellow owed his guardian £74::18::2 on balance. He paid off £41::14::8 and then declared that his sister owed the gentleman half as much again as himself.

Being

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Being told of this circumſtance, ſhe pays off in part £13::12::10, and gives out that her uncle Joſeph was not leſs in arrears than her brother and ſhe together. In conſequence of this the uncle pays in £24::7::3, and then the uncle's brother, who by the bye, was not the uncle of thoſe children, for £150 undertakes to ſet them all clear, and has £35::15::5 to ſpare, according to his account. I deſire to know whether this be true or not?

26. Three boys met a ſervant maid carrying apples to the market. The firſt took half what ſhe had, but returned her ten; the ſecond took one third, but returned two; and the third took away half thoſe ſhe had left, but returned her one. She had then twelve apples left: how many had ſhe at firſt? *Anſ.* 40.

BILLS *of* PARCELS.

HOSIER'S.

Mr. John Thomas,

Bought of Samuel Green, March 7, 1792.

		s.	d.		
8	Pair of worſted ſtockings, at	4	6 *per* pair,	£	
5	Pair of thread ditto - at	3	2	-	-
3	Pair of black ſilk ditto at	14	0	-	-
6	Pair of milled hoſe - at	4	2	-	-
4	Pair of cotton ditto - at	7	6	-	-
2	Yards of fine flannel at	1	8	-	-

£ 7 :: 12 :: 2

MERCER'S.

Mr. Iſaac Grant,

Bought of John Sims, March 7, 1792.

		s.	d.		
15	Yards of ſatin, at	9	6 *per* yard	£	
18	Yards of flowered ſilk, at	17	4	-	-
12	Yards of rich brocade, at	19	8	-	-
16	Yards of ſarſenet, at	8	2	-	-
13	Yards of Genoa Velvet at	27	6	-	-
23	Yards of luteſtring, at	6	3	-	-

£. 62 :: 5 :: 2.

LINEN-

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LINEN-DRAPER'S.

Mr. Simon Surety,
Bought of Josiah Short, March 27, 1792.

			s.	d.	
4	Yards of cambrick	at	12	6	*per* yard £.
12	Yards of muslin	at	8	3	
15	Yards of printed linen	at	5	4	
2	Dozen of napkins	at	2	3	each
14	Ells of diaper	at	1	7	*per* ell
35	Ells of dowlas	at	1	1½	

£. 17 .. 4 .. 6½

£ 14 .. 15 .. 0 ½

MILLINER'S.

Mrs. Bright,
Bought of Lucy Brown, April 5, 1792.

			l.	s.	d.	
18	Yards of fine lace	at	0	12	3	*per* yard £.
5	Pair of fine kid gloves	at	0	2	2	*per* pair
12	Fans of French mounts	at	0	3	6	each
2	Fine laced tippets	at	3	3	0	
4	Dozen Irish lamb	at	0	1	3	*per* pair
6	Sets of knots	at	0	2	6	*per* set

£. 23 .. 14 .. 4

WOOLLEN-DRAPER'S.

Mr. Thomas Sage,
Bought of Ellis Smith, April 7, 1792.

			l.	s.	d.	
17	Yards of fine serge	at	0	3	9	*per* yard £.
18	Yards of drugget	at	0	9	0	
15	Yards of superfine scarlet	at	1	2	0	
16	Yards of black	at	0	18	0	
25	Yards of shalloon	at	0	1	9	
17	Yards of drab	at	0	17	6	

£. 59 .. 5 .. 0

LEATHER-

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LEATHER-SELLER'S.

Mr. Giles Harris,

Bought of Abel Smith, April 15, 1792.

		s.	d.		£.		
27	Calf skins - -	at	3	9 *per* skin			
75	Sheep ditto - -	at	1	7	-	-	
36	Coloured ditto -	at	1	8	-	-	
15	Buck ditto - -	at	11	6	-	-	
17	Russia hides - -	at	10	7	-	-	
120	Lamb-skins - -	at	1	2½	-	-	
					£.	38	17 5

GROCER'S.

Mr. Richard Groves,

Bought of Francis Elliot, April 21, 1792.

		s.	d.		£.		
25	lb. of lump sugar -	at	0	6½ *per lb.*			
2	loaves of double refined, weight 15 lb.	at	0	11½	-	-	
14	lb. of rice -	at	0	3	-	-	
28	lb. of Malaga raisins	at	0	5	-	-	
15	lb. of currants -	at	0	5½	-	-	
7	lb. of black pepper	at	1	10	-	-	
					£.	3	2 9½

CHEESEMONGER'S.

Mr. Charles Cross,

Bought of Samuel Grant, April 23, 1792.

		s.	d.		£.		
8	lb. of Cambridge butter	at	0	6 *per* lb.			
17	lb. of new cheese -	at	0	4	-		
½	Firkin of butter, wt. 28 lb.	at	0	5½	-		
5	Cheshire cheeses, wt. 127 lb.	at	0	4	-		
2	Warwickshire do. wt. 15 lb.	at	0	3	-		
12	lb. of cream cheese -	at	0	6	-		
					£.	3	14 7

CORN-

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CORN-CHANDLER'S.

Mr. Abraham Doyley,

Bought of Iſaac Jones, April 29, 1792.

			s.	d.	
Tares,	19 buſhels -	at	1 ..	10	*per buſhel* £
Peas,	18 buſhels -	at	3 ..	9½	- -
Malt,	7 quarters	at	25 ..	0	*per* quarter
Hops,	15 lb. -	at	1 ..	5	*per* lb.
Oats,	6 quarters	at	2 ..	4	*per* buſhel
Beans,	12 buſhels -	at	4 ..	8	- -

£. 23 .. 7 .. 4

REDUCTION

IS the bringing or reducing numbers of one denomination into other numbers of another denomination, retaining the ſame value, and is performed by multiplication and diviſion.

Firſt, All great names are brought into ſmall by multiplying with ſo many of the leſs as make one of the greater.

Secondly, All ſmall names are brought into great, by dividing with ſo many of the leſs as make one of the greater.

A TABLE *of ſuch* COINS *as are current in* England.

	l.	s.	d.
Guinea - -	1 ..	1 ..	0
Half ditto - -	0 ..	10 ..	6
Quarter ditto -	0 ..	5 ..	3
Crown - -	0 ..	5 ..	0
Half ditto - -	0 ..	2 ..	6
Shilling - -	0 ..	1 ..	0

Note, *There are ſeveral pieces which ſpeak their own value: ſuch as ſix-pence, four-pence, three-pence, two-pence, penny, half-penny, farthing.*

REDUCTION

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REDUCTION *Descending.*

1. In £.8 how many shillings and pence?

20

160 *shillings.*

12

1920 *pence.*

2. In £12. how many shillings, pence, and farthings?
Ans. 240*s.* 2880*d.* 11520 *far.*

3. How many shillings, pence, and farthings, are there in £18? *Ans.* 360*s.* 4320*d.* 17280 *far.*

4. Reduce £7. and a crown into shillings and pence.
Facit. 145*s.* 1740*d.*

5. How many farthings are there in 21 guineas?
Ans. 21168.

6. In £17..5..3¼ how many farthings?
Ans. 16573.

7. In £25..14..1 how many shillings and pence?
Ans. 514*s.* 6169*d.*

8. In 15 crowns, how many shillings and sixpences.
Ans. 75*s.* 150 *six-pences.*

9. How many crowns and shillings in £25.?
Ans. 100 *crowns,* 500*s.*

10. In 57 half crowns, how many pence and farthings?
Ans. 1710*d.* 6840 *farthings.*

11. In 52 crowns, as many half crowns, shillings, and pence, how many farthings? *Ans.* 21424.

12. How many half-crowns, sixpences, and threepences, are there in £75.?
Ans. 600 *half-crowns,* 3000 *six-pences,* 6000 *three-pences.*

REDUCTION *Ascending.*

13. In 1920 pence, how many shillings and pounds?
Ans. 160*s.* £8.

12)1920

2|0)16|0 *shillings.*

8 *Pounds.*

14. In

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14. In 11520 farthings, how many pence, ſhillings, and Pounds? *Anſ.* 2880*l.* 240*s.* 12*l.*

15. How many pence, ſhillings, and pounds, are there in 17280 farthings? *Anſ.* 4320*l.* 360*s.* 18*l.*

16. Reduce 1740 pence into ſhillings and pounds.
Facit 145*s.* 7*l.* 5*s.*

17. How many guineas in 21168 farthings?
Anſ. 21 *Guineas.*

18. In 16573 farthings, how many pounds?
Anſ. £17::5::3¼.

19. In 6169 pence, how many ſhillings and pounds?
Anſ. 514*s.* £25::14::1.

20. In 900 pence, how many ſhillings and crowns?
Anſ. 75*s.* 15 *crowns.*

21. How many crowns and pounds in 500 ſhillings?
Anſ. 100 *crowns*, £25.

22. In 6840 farthings, how many pence and half crowns?
Anſ. 1710*d.* 57 *half crowns.*

23. In 21424 farthings, how many crowns, half crowns, ſhillings, and pence, and of each an equal number?
Anſ. 52.

24. How many ſixpences, half crowns and pounds, in 6000 threepences?
Anſ. 3000 *ſixpences*, 600 *half crowns*, £75.

ASCENDING *and* DESCENDING.

25. In 1560 pence, how many crowns and ſhillings?
Anſ. 26 *crowns*, 130*s.*

60)1560

26
5

130

26. Reduce 130 ſhillings into crowns and pence.
Facit 26 *crowns*, 1560*l.*

27. How many ſhillings, crowns and pounds in 60 guineas?
Anſ. 1260*s.*, 252 *crowns*, £63.

28. In £63, how many crowns, ſhillings, and guineas?
Anſ. 252 *crowns*, 1260*s.* 60 *guineas.*

29. Reduce 76 moidores into ſhillings and pounds.
Facit 2052*s.* £102::12.

30. Reduce £102::12 into ſhillings and moidores.
Facit 2052*s.* 76 *moidores.*

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31. How many ſhillings, half crowns, and crowns, are there in £556, and of each an equal number?

Anſ 1308 *each, and* 2*s. over.*

32. In 1308 half crowns, as many crowns, and ſhillings, how many pounds? *Anſ.* £555::18.

33. Seven men brought £15::10 each into the mint, to be changed for guineas: How many muſt they have in all?

Anſ. 103 *guineas,* 7*s. over.*

34. If 103 guineas and 7 ſhillings are to be divided amongſt 7 men: How many pounds ſterling is that to each?

Anſ. £15::10.

35. A certain perſon had 25 purſes, and in each purſe 12 guineas, a crown, and a moidore, how many pounds ſterling had he in all? *Anſ.* £355.

36. A gentleman, in his will, leaves £50 to the poor, and ordered that $\frac{1}{3}$ ſhould be given to ancient men, each to have 5*s.*—$\frac{1}{4}$ to poor women, each to have 2*s.* 6*d.*—$\frac{1}{5}$ to poor boys, each to have 1*s.*—$\frac{1}{6}$ to poor girls, each to have 9*d.* and the remainder to the perſon who diſtributed it. I demand how many of each ſort there were, and what the perſon that diſtributed the money had for his pains?

Anſ. 66 *men,* 100 *women,* 200 *boys,* 222 *girls,* £2::13::6 to the perſon.

TROY WEIGHT.

37. In 27 ounces of gold, how many grains?

Anſ. 12960.

38. In 12960 grains of gold, how many ounces?

Anſ. 27.

39. In 3 lb. 10 oz. 7 dwts. 5 gr. how many grains?

Anſ. 22253.

40. In 8 ingots of ſilver, each weighing 7 lb. 4 oz. 17 dwt. 15 gr. how many ounces, pennyweights, and grains?

Anſ. 711 *oz.* 14221 *dwt.* 341304 *gr.*

41. How many ingots of 7 lb. 4 oz. 17 dwts. 15 gr. each are there in 341304 grains? *Anſ.* 8 *ingots.*

42. Bought 7 ingots of ſilver, each containing 23lb. 5 oz. 7 dwt. how many grains? *Anſ.* 945336.

43. A gentleman ſent a tankard to his goldſmith, that weighed 0 oz. 0 dwt. and ordered him to make it into ſpoons, each to weigh 2 oz. 16 dwt. How many had he? *Anſ.* 18.

44. A

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44. A gentleman delivered to a goldſmith 137 oz. 6 dwt. 9 gr. of ſilver, and ordered him to make it into tankards of 17 oz. 15 dwt. 10 gr. each, ſpoons of 21 oz. 11 dwt. 13 gr. per doz. ſalts of 3 oz. 10 dwt. each, and forks of 21 oz. 11 dwt. 13 gr. per dozen; and, for every tankard, to have one ſalt, a dozen of ſpoons, and a dozen of forks: What is the number of each he muſt have?

Anſ. Two of each ſort, 8 oz. 9 dwt. 9 gr. over.

AVOIRDUPOISE WEIGHT.

Note, *There are ſeveral ſorts of ſilk which are weighed by a great pound of 24 oz. others by the common pound of 16 oz. therefore,*

To bring great pounds into common, multiply by 3, and divide by 2, or add one half.

To bring ſmall pounds into great, multiply by 2, and divide by 3, or ſubtract one third.

Things bought and ſold by the Tale.

Dozens.		*Paper and Parchment.*	
12 Pieces or things make	1 Doz.	24 Sheets make	1 Quire
12 Dozen - -	1 Groſs.	20 Quire -	1 Ream
12 Groſs or 144 Doz	1 Great. Groſs.	2 Reams -	1 Bund.
		1 Doz. of Par.	12 Skins
		5 Doz. -	1 Roll

45. In 14769 ounces: How many cwt.?

Anſ. 8 cwt. 0 qrs. 27 lb. 1 oz.

46. Reduce 8 cwt. 0 qr. 27 lb. 1 oz. into quarters, pounds, and ounces.

Facit 32 qrs. 923 lb. 14769 oz.

47. Bought 32 bags of hops, each 2 cwt. 1 qr. 14 lb. and another of 150 lb. How many cwt. in the whole?

Anſ. 77 cwt. 1 qr. 10 lb.

48. In 34 ton, 17 cwt. 1 qr. 19 lb. how many pounds?

Anſ. 78111 lb.

49. In 350 great pounds, how many common? *Anſ. 525 lb.*

50. In 27 cwt. of raiſins, how many parcels of 18 lb. each?

Anſ. 168.

51. In 9 cwt. 2 qrs. 14 lb. of indigo, [illegible] pounds?

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52. In 547 great pounds, how many common pounds?
Anſ. 820 *common lb.* 8 *oz.*

53. Bought 27 bags of hops, each 2cwt. 1qr. 15lb. and 1 bag of 137lb. How many hundreds in the whole?
Anſ. 65 *cwt.* 2 *qrs.* 10 *lb.*

54. How many pounds in 27 hogſheads of tobacco, each weighing neat 8cwt. ¾? *Anſ.* 26460.

55. In 552 common pounds of ſilk, how many great pounds? *Anſ.* 368.

56. How many parcels of ſugar of 16lb. 2 oz. are there in 16 cwt. 1 qr. 15 lb.? *Anſ.* 113 *par.* 12 *lb.* 14 *oz.*

The Allowances uſually made in this Weight are TARE, TRET *and* CLOFF.

TARE is an allowance made to the buyer for the weight of the box, barrel, bag, &c. which contains the goods bought, and is either

At ſo much per box, bag, barrel, &c.

At ſo much per cent. or,

At ſo much in the groſs weight,

TRET is an allowance of 4lb. in every 104lb. for waſte, duſt, &c. made by the merchant to the buyer.

CLOFF is an allowance of 2lb to the citizens of London, on every draught above 3cwt. on ſome ſort of goods.

GROSS WEIGHT is the whole weight of any ſort of goods, and that which contains it.

SUTTLE is when part of the allowance is deducted from the groſs.

NEAT is the pure weight, when all allowances are deducted.

RULE 1ſt. When the tare is at ſo much per bag, barrel, &c. multiply the number of bags, barrels, &c. by the tare, and ſubtract the produce from the groſs, the remainder is neat.

Note, *To reduce pounds into gallons, multiply by* 2, *divide by* 15.

57. In 7 frails of raiſins, each weighing 5 cwt. 2 qrs. 5lb. groſs, tare at 23lb. per frail, how much neat weight?
Anſ. 37 *cwt.* 1 *qr.* 14 *lb.*

58. In

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			or thus:
23	5 .. 2 .. 5		5 .. 2 .. 5
7	7	—	23
)4)			
28)161(5	38 .. 3 .. 7 = *gross.*		5 .. 1 .. 10
140 1 .. 1	1 .. 1 .. 21 = *tare.*		7
21	37 .. 1 .. 14 *neat.*		37 .. 1 .. 14

58. In 241 barrels of figs, each 3qrs. 19lb. gross, tare 10lb. *per* barrel, how many pounds neat? *Ans.* 22413.

59. What is the neat weight of 25 hogsheads of tobacco, weighing gross 163 cwt. 2 qrs. 15 lb. tare 100lb. *per* hogshead? *Ans.* 141 *cwt.* 1 *qr.* 7 *lb.*

60. In 16 bags of pepper, each 85lb. 4 oz. gross, tare *per* bag, 3 lb. 5 oz. how many pounds neat? *Ans.* 1311.

RULE 2. When the tare is at so much in the whole gross weight, subtract the given tare from the gross, the remainder is neat.

61. What is the neat weight of 5 hogsheads of tobacco, weighing gross 75 cwt. 1 qr. 14 lb. tare in the whole 752 lb.? *Ans.* 68 *cwt.* 2 *qrs.* 18*lb.*

62. In 75 barrels of figs, each 2 qrs. 27 lb. gross, tare in the whole 597 lb. how much neat weight? *Ans.* 50 *cwt.* 1*qr.*

RULE 3. When the tare is at so much *per* cwt. divide the gross weight by the aliquot parts of an cwt. which subtract from the gross, the remainder is neat.

Note, 7lb. is $\frac{1}{16}$. 8lb. is $\frac{1}{14}$. 14lb is $\frac{1}{8}$. 16lb. $\frac{1}{7}$.

63. What is the neat weight of 18 butts of currants, each 8 cwt. 2 qrs. 5 lb. tare at 14 lb. *per* cwt.?

8 .. 2 .. 5
9 × 2 = 18

76 .. 3 .. 17
2

14 = $\frac{1}{8}$)153 .. 3 .. 6
19 .. 0 .. 25$\frac{1}{4}$

134 .. 2 .. 8$\frac{3}{4}$

64. In 25 barrels of figs, each 2 cwt. 1 qr. groſs, tare *per cent.* 16 lb. how much neat weight?

Anſ. 48 *cwt.* 0 *qr.* 24 *lb.*

65. What is the neat weight of 9 hogſheads of nutmegs, each weighing groſs, 8 cwt. 3 qrs. 14 lb. tare 16lb. *per cent.*?

Anſ. 68 *cwt.* 1 *qr.* 24 *lb.*

66. What is the neat weight of 12 caſks of argol, groſs 84 cwt. 2 qrs. 14 lb. tare *per cent.* 14lb.

Anſ. 74 *cwt.* 0 *qr.* 5 *lb.* $\frac{1}{4}$.

RULE 4. When tret is allowed with tare, divide the pounds ſuttle by 26, the quotient is the tret, which ſubtract from the ſuttle, the remainder is neat.

67. In one butt of currants, weighing 12 cwt. 2 qrs. 24 lb. groſs, tare 14 lb. *per cent.* trett 4 lb. *per* 104 lb. how many pounds neat?

12 .. 2 .. 24
4
—
50
28
—
14 = $\frac{1}{8}$) 1424 *groſs.*
178 *tare.*
—
26) 1246 *ſuttle.*
47 *tret.*
—
1199 *neat.*

68. In 7 cwt. 3 qrs. 27 lb. groſs, tare 36 lb. tret 4 lb. *per* 104 lb. how many pounds neat? *Anſ.* 826 *lb.*

69. In 152 cwt. 1 qr. 3 lb. groſs, tare 10 lb. *per cent.* tret 4lb. *per* 104 lb. how much neat weight?

Anſ. 103 *cwt.* 1 *qr.* 11 *lb.*

70. In 15 cheſts of ſugar, weighing 117 cwt. 0 qr. 21lb. groſs, tare 173 lb. tret 4lb. *per* 104 lb. how many cwt. neat? *Anſ.* 111 *cwt.* 0 *qr.* 22 *lb.*

RULE 5. When cloff is allowed, multiply the cwt. ſuttle by 2, divide the product by 3, the quotient will be the pounds cloff, which ſubtract from the ſuttle, the remainder will be neat.

71. What

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71. What is the neat weight of 3 hogſheads of tobacco, weighing 15 cwt. 3 qrs. 20 lb. groſs, tare 7lb. *per cent.* tret 4lb. *per* 104 lb. cloff 2 lb. for 3 cwt. ?

Anſ. 14 *cwt.* 1 *qr.* 3 *lb.*

$7 = \frac{1}{16})15 .. 3 .. 20$ *groſs.*
3 .. $27\frac{1}{2}$ *tare.*

14 .. 3 .. $20\frac{1}{2}$ *ſuttle.*
2 .. 8 *tret.*

14 .. 1 .. $12\frac{1}{2}$ *ſuttle.*
$9\frac{1}{2}$ *cloff.*

14 .. 1 .. 3 *neat*

72. In 7 hogſheads of tobacco, each weighing groſs 5 cwt. 2 qrs. 7 lb. tare 8 lb. *per cent.* tret 4 lb. *per* 104 lb. cloff 2 lb. *per* 3 cwt. how much neat weight ?

Anſ. 34 *cwt.* 2 *qrs.* 8 *lb.*

APOTHECARIES WEIGHT.

73. In 27 lb. 7 ℥ . 2 ʒ . 1 ℈ . 2 gr. how many grains ?

Anſ. 159022.

74. How many lb. ℥ . ʒ . ℈ . and gr. are there in 159022 grains ? *Anſ.* 27 *lb.* 7 ℥ . 2 ʒ . 1 ℈ . 2 *gr.*

CLOTH MEASURE.

75. In 27 yards, how many nails ? *Anſ.* 432.

76. In 75 Engliſh ells, how many yards ?

Anſ. 93 *yards*, 3 *qrs.*

77. In $93\frac{3}{4}$ yards, how many Engliſh ells ? *Anſ* 75.

78. In 24 pieces, each containing 32 Flemiſh ells, how many Engliſh ells ? *Anſ.* 460 *ells.* 4 *qrs.*

79. In 17 pieces of cloth, each 27 Flemiſh ells, how many yards ? *Anſ.* 344 *yards*, 1 *qr.*

80. Bought 27 pieces of Engliſh ſtuffs, each 27 ells, how many yards ? *Anſ.* 911 *yards*, 1 *qr.*

81. In $911\frac{1}{4}$ yards, how many Engliſh ells ? *Anſ.* 729.

82. In 12 bales of cloth, each 25 pieces, each 15 Engliſh ells, how many yards ? *Anſ.* 5625.

LONG

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LONG MEASURE.

83. 57 miles, how many furlongs and poles?
Anſ. 456 *furlongs*, 18240 *poles.*

84. In 7 miles, how many feet, inches and barley-corns?
Anſ. 36960 *feet*, 443520 *inches*, 1330560 *barley-corns.*

85. In 18240 poles, how many furlongs and miles?
Anſ. 456 *furlongs*, 57 *miles.*

86. In 72 leagues, how many yards? *Anſ.* 380160.

87. In 380160 yards, how many miles and leagues?
Anſ. 216 *miles*, 72 *leagues.*

88. If from London to York be accounted 50 leagues, I demand how many miles, yards, feet, inches, and barley-corns? *Anſ.* 150 *miles*, 264000 *yards*, 792000 *feet*, 9504000 *inches*, 28512000 *barley-corns.*

89. How many barley-corns will reach round the world, which is 360 degrees, each degree 69 miles and a half?
Anſ. 4755801600 *barley-corns.*

LAND MEASURE.

90. In 27 acres, how many roods and perches?
Anſ. 108 *roods*, 4320 *perches.*

91. In 4320 perches, how many acres? *Anſ.* 27.

92. A perſon having a piece of ground, containing 37 acres, 1 pole, has a mind to diſpoſe of 15 acres to A, I deſire to know how many perches he will have left?
Anſ. 3521.

93. There are 4 fields to be divided into ſhares of 75 perches each; the firſt field containing 5 acres; the ſecond 4 acres, 2 poles; the third, 7 acres 3 roods; and the fourth, 2 acres, 1 rood; I deſire to know how many ſhares are contained therein? *Anſ.* 40 *ſhares*, 42 *perches.*

WINE MEASURE.

94. Bought 5 tuns of port wine; how many gallons and pints? *Anſ.* 1260 *gallons*, 10080 *pints.*

95. In 10080 pints, how many tuns? *Anſ.* 5.

96. In 5896 gallons of Canary, how many pipes and hogſheads, and of each a like number?
An. 31 *of each*, 37 *gallons over.*

97. A

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97. A gentleman ordered his butler to bottle off $\frac{2}{3}$ of a pipe of French wine into quarts, and the reſt into pints; I deſire to know how many dozen of each he had?
Anſ. 28 *dozen of each.*

ALE and BEER MEASURE.

98. In 46 barrels of beer, how many pints? *Anſ.* 13248.
99. In 10 barrels of ale, how many gallons and quarts?
Anſ. 320 *gals.* 1280 *qts.*
100. In 72 hogſheads of beer, how many barrels?
Anſ. 108 *barrels.*
101. In 108 barrels of beer, how many hogſheads?
Anſ. 72.

DRY MEASURE.

102. In 120 quarters of wheat, how many buſhels, pecks, gallons, and quarts?
Anſ. 960 *buſhels*, 3840 *pecks*, 7680 *gallons*, 30720 *qts.*
103. In 30720 quarts of corn, how many quarters?
Anſ. 120.
104. In 20 chaldrons of coals, how many pecks?
Anſ. 2880.
105. In 273 laſts of corn, how many pecks?
Anſ. 87360.

TIME.

106. In 72015 hours, how many weeks?
Anſ. 428 *weeks*, 4 *days*, 15 *hours.*
107. How many days is it ſince the birth of our Saviour to Chriſtmas 1755? *Anſ.* 641013 *days*, 18 *hours.*
108. Stowe writes, London was built 1108 years before our Saviour's birth, how many hours is it ſince to Chriſtmas 1755? *Anſ.* 25272378 *hours.*
109. From November 17, 1738, to September 12, 1739, how many days? *Anſ.* 299.
110. From July 18, 1749, to December 27, in the ſame year, how many days? *Anſ.* 162 *days.*
111. From July 18, 1723, to April 18, 1750, how many years and days?
Anſ. 26 *years*, 9770 *days*, *reckoning* 365 *days*, 6 *hours a year.*

The

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The SINGLE RULE *of* THREE DIRECT

TEACHETH, by three numbers given, to find out a fourth, in such proportion to the third, as the second is to the first.

RULE. First state the question, that is, place the numbers in such order, that the first and third be of one kind, and the second the same as the number required; then bring the first and third numbers into one name, and the second into the lowest term mentioned. Multiply the second and third numbers together, and divide the product by the first, the quotient will be the answer to the question in the same denomination you left the second number in.

EXAMPLES.

1. If 1 lb. of sugar cost $4\frac{1}{2}d.$ what cost 54 lb.?

1 .. .. $4\frac{1}{2}$ .. 54

4 18

18 4)972

12)243

20s. $3d.$

Anf. 1 .. 0 .. 3.

2. If a gallon of beer cost $3d.$ what is that *per* barrel?
Anf. 9s.

3. If a pair of shoes cost 4s. 6d. what will 12 dozen come to? *Anf.* £32..8..0.

4. If 12 dozen pair of stockings cost £.32..8..0. what is that *per* pair? *Anf* 4s. 6d.

5. If 1 yard of cloth cost 15s. 6d. what will 32 yards cost at the same rate? *Anf.* 24 .16..0.

6. If 32 yards of cloth cost £.24..16..0. what is the value of 1 yard? *Anf.* 15s. 6d.

7. If 1 lb. of sugar cost $10\frac{1}{2}d.$ what is the worth of 1 cwt.?
Anf. £4..18..0.

8. If I gave £4..18..0. for 1 cwt. of sugar, at what rate did I buy it *per* lb.? *Anf.* $10\frac{1}{2}d.$

9. If I buy 20 pieces of cloth, each 20 ells, for 12s. 6d. *per* ell, what is the value of the whole? *Anf.* £250.

10. Bought 20 pieces of Holland, each 20 ells, for £250, what is that *per* ell? *Anf.* 12s. 6d.

11. What

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11. What will 25 cwt. 3 qrs. 14 lb. of tobacco come to, at $15\frac{1}{2}d.$ *per* lb. *Anſ.* £187..3..3.

12. I gave £187..3..3. for 25 cwt. 3 qrs. 14 lb. of tobacco, at what rate did I buy it at *per* lb.? *Anſ.* $15\frac{1}{2}d.$

13. Bought $27\frac{1}{4}$ yds. muſlin, at 6*s.* $9\frac{1}{2}d.$ *per* yard, what does it amount to? *Anſ.* £9..5..$0\frac{3}{4}$. 2 *rem.*

14. Bought 17 cwt. 1 qr. 14 lb. of iron, at $3\frac{3}{4}d.$ *per* lb. what does it come to? *Anſ.* £26..7..$0\frac{1}{2}$.

15. If coffee is ſold for $5\frac{1}{2}d.$ *per* ounce, what muſt be given for 2 cwt.? *Anſ.* £82..2..8.

16. How many yards of cloth may be bought for £21..11..$1\frac{1}{2}$, when $3\frac{1}{2}$ yards coſt £2..14..3.?
Anſ. 27 *yds.* 3 *qrs.* 1 *nail*, 84 *rem.*

17. If $3\frac{1}{2}$ lb. of Cheſhire cheeſe coſt 1*s.* 1*d.* what coſt 1 cwt.? *Anſ.* £1..14..8.

18. If 1 cwt. of Cheſhire cheeſe coſt £1..14..8. what muſt I give for $3\frac{1}{2}$ lb. *Anſ.* 1*s.* 1*d.*

19. Bought 1 cwt. 24 lb. 8 oz. of old lead, at 9*s.* *per* cwt. what does it come to? *Anſ.* 10*s.* $11\frac{1}{2}d.$ 112 *rem.*

20. If 1 cwt. 24 lb. 8 oz. of lead be worth 10*s.* $11\frac{1}{2}d.$ $\frac{1}{2}\frac{1}{2}\frac{2}{4}$ what is that *per* cwt. *Anſ.* 9*s.*

21. If a gentleman's income is £500 a year, and he ſpends 19*s.* 4*d.* *per* day, how much does he lay by at the year's end?
Anſ. 147..3..4.

22. If I buy 14 yards of cloth for 10 guineas, how many Flemiſh ells can I buy for £283..17..6. at the ſame rate?
Anſ. 504 *Fl. ells*, 2 *qrs.*

23. If 283..17..6. will buy 504 Flemiſh ells, 2 quarters, what quantity of yards can I have for £10..10..0.?
Anſ. 14 *yds.*

24. If 504 Flemiſh ells, 2 quarters, coſt £283..17..6. at what rate muſt I give for 14 yards? *Anſ.* £10..10..0.

25. Gave £1..1..8. for 3 lb. of coffee, what muſt be given for 29 lb. 4 oz. *Anſ.* £10..11..3.

26. Bought 29 lb. 4 oz. of coffee, for £10..11..3. what is the value of 3 lb. *Anſ.* £1..1..8.

27. If $1\frac{1}{2}$ oz. of coffee coſt $6\frac{1}{4}d.$ what will $3\frac{1}{4}$ oz. coſt at the ſame rate? *Anſ.* 1*s.* $1\frac{1}{2}d.$ 1 *rem.*

28. If 1 Engliſh ell, 2 quarters, coſt 4*s.* 7*d.* what will $39\frac{1}{2}$ yards coſt at the ſame rate? *Anſ.* 5*l.* 3*s.* $5\frac{1}{4}d.$

29. If 1 ounce of gold is worth £5..4..2. what is the worth of 1 grain? *Anſ.* $2\frac{1}{2}d.$ 20 *rem.*

30. If

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30. If 14 yards of broad cloth coſt £9..12..0. what is the purchaſe of 75 yards? *Anſ.* £51..8..6¾. 6 *rem.*

31. If 27 yards of Holland coſt £51..12..6. how many ells Engliſh can I buy for £100? *Anſ.* 384.

32. If 1 cwt. coſt £12..12..6. what muſt I give for 14 cwt. 1 qr. 19 lb.? *Anſ.* £182..0..11¼. 8 *rem.*

33. Bought 7 yards of cloth for 17*s.* 8*d.* what muſt be given for 5 pieces, each containing 27½ yards?

Anſ. 17..7..0¼. 2 *rem.*

34. If 7 oz. 11 dwt. of gold be worth £35. what is the value of 14 lb. 9 oz. 12 dwt. 16 gr. at the ſame rate?

Anſ. £823..9..3¼. 552 *rem.*

35. A draper bought 420 yards of broad cloth, at the rate of 14*s.* 10¾*d.* *per* ell Engliſh, how much did he pay for the whole? *Anſ.* £250..5..0.

36. A gentleman bought a wedge of gold, which weighed 14 lb. 3 oz. 8 dwt. for the ſum of £514..4..0. at what rate did he pay for it *per* ounce? *Anſ.* £3.

37. A grocer bought 4 hogſheads of ſugar, each weighing neat 6 cwt. 2 qrs. 14 lb. which coſt him £2..8..6. *per* cwt. what is the value of the 4 hogſheads? *Anſ.* £64..5..3.

38. A draper bought 8 packs of cloth, each containing 4 parcels, each parcel 10 pieces, and each piece 26 yards, and gave after the rate of £4..16..0. for 6 yards, I deſire to know what the 8 packs ſtood him in? *Anſ.* £6656.

39. If 24 lb. of raiſins coſt 6*s.* 6*d.* what will 18 frails coſt, each weighing neat 3 qrs. 18 lb.? *Anſ.* £24..17..3.

40. If 1 ounce of ſilver be worth 5*s.* what is the price of 14 ingots, each weighing 7 lb. 5 oz. 10 dwt. £313..5.

41. What is the price of a pack of wool weighing 2 cwt. 1 qr. 19 lb. at 8*s.* 6*d.* *per* ſtone? *Anſ.* £8..4..6¼. 10 *rem.*

42. Bought 59 cwt. 2 qrs. 24 lb. of tobacco, at £2..17..4. *per* cwt. what does it come to? *Anſ* £171..3..7¼. 80 *rem.*

43. What is the half year's rent of 547 acres of land, at 15*s.* 6*d.* *per* acre *per annum?* *Anſ.* £211..19..3.

44. Bought 171 ton of lead, at £14 *per* ton; paid carriage and other incident charges, £4..10..0. I require the value of the lead, and what it ſtands me in *per* lb.?

Anſ. £2398..10..0 *value*, 1½*d.* *per* lb. 432 *rem.*

45. If a pair of ſtockings coſt 10 groats, how many dozen may I buy for £43..5..0.? *Anſ.* 21 *doz.* 7½ *pair.*

46. Bought

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46. Bought 27 dozen, 5lb. of candles, after the rate of 17*d.* per 3lb. What did they coſt me?

Anſ. £7..15..4¼. 1 *rem.*

47. If an ounce of fine gold is ſold for £3..10..0. what comes 7 ingots to, each weighing 3 lb. 7 oz. 14 dwt. 21 gr. at the ſame price? *Anſ.* £1071..14 .5¼.

48. If my horſe ſtands me in 9*d*½ per day keeping, what will be the charge of 11 horſes for the year?

Anſ. £158..18..6½.

49. A factor bought 86 pieces of ſtuff, which coſt him £517..19..4. at 4*s.* 10*d. per* yard, I demand how many yards there were, and how many ells Engliſh in a piece?

Anſ. 2143 yards ¼, 56 *rem. and* 19 *ells*, 4 *quarters*, 2 *nails*, 64 *rem. in a piece.*

50. A gentleman hath an annuity of £896..17..0. *per annum.* I deſire to know how much he may ſpend daily, that at the year's end he may lay up 200 guineas, and give to the poor quarterly 10 moidores? £1..14..8. 44 *rem.*

The RULE *of* THREE INVERSE.

INVERSE PROPORTION is, when more requires leſs, and leſs requires more. More requires leſs, is when the third term is greater than the firſt, and requires the fourth term to be leſs than the ſecond. And leſs requires more, is when the third term is leſs than the firſt, and requires the fourth term to be greater than the ſecond.

RULE. Multiply the firſt and ſecond terms together, and divide the product by the third, the quotient will bear ſuch proportion to the ſecond as the firſt does to the third.

EXAMPLE.

1. If 8 men can do a piece of work in 12 days, how many days can 16 men perform the ſame in? *Anſ.* 6 *days.*

8 : 12 : : 16 : : 6

8

16)96(6 *days.*

2. If 54 men can build a houſe in 90 days, how many men can do the ſame in 50 days? *Anſ.* 97 *men*⅕.

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3. If, when a peck of wheat is ſold for 2*s.* the penny loaf weighs 8 oz. how much will it weigh when the peck is worth but 1*s.* 6*d*? *Anſ.* 10 *oz.* 10 *dr.* $\frac{1}{2}$.

4. How many pieces of money of 20*s.* value are equal to 240 pieces of 12*s.* each? *Anſ.* 144.

5. How many yards of three quarters wide are equal in meaſure to 30 yards of 5 quarters wide? *Anſ.* 50.

6. If I lend my friend £200 for twelve months, how long ought he to lend me £150. to requite my kindneſs?

Anſ. 16 *months.*

7. If for 24*s.* I have 1200 lb. carried 36 miles, how many pounds can I have carried 24 miles for the ſame money?

Anſ. 1800 *lb.*

8. If 108 workmen finiſh a piece of work in 12 days, how many are ſufficient to finiſh it in 3 days? *Anſ.* 432.

9. An army beſieging a town, in which were 1000 ſoldiers, with proviſion for three months, how many ſoldiers departed, when the proviſions laſted them ſix months?

Anſ. 500.

10. If £20. worth of wine is ſufficient to ſerve an ordinary of 100 men, when the tun is ſold for £30. how many will £20. worth ſuffice, when the tun is ſold but for £24?

Anſ. 125 *men.*

11. A courier makes a journey in 24 days, when the day is but 12 hours long, how many days will he be going the ſame journey, when the days are 16 hours long?

Anſ. 18 *days.*

12. How much pluſh is ſufficient for a cloak, which has in it 4 yards of 7 quarters wide of ſtuff for the lining, the pluſh being but 3 quarters wide? *Anſ.* 9 *yards* $\frac{1}{3}$.

13. If 14 pioneers make a trench in 18 days, how many days will 34 take to do the ſame?

Anſ. 7 *days*, 4 *hours*, 56 *minutes*, 16 *rem.*

14. Borrowed of my friend £64. for 8 months, and he hath occaſion another time to borrow of me for 12 months, how much muſt I lend him to requite his former kindneſs to me?

Anſ. 42..13..4.

15. A regiment of ſoldiers, conſiſting of 1000 men, are to have new coats, each coat to contain 2 yards $\frac{1}{2}$ of cloth, 5 quarters wide, and to be lined with ſhalloon of 3 quarters wide: I demand how many yards of ſhalloon will line them?

Anſ. 4166 *yards*, 2 *quarters*, 2 *nails*, 2 *rem.*

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THE DOUBLE RULE OF THREE

IS ſo called, becauſe it is compoſed of 5 numbers given to find a ſixth, which, if the proportion is direct, muſt bear ſuch proportion to the 4th and 5th, as the 3d bears to the 1ſt and 2d. But if inverſe, the 6th number muſt bear ſuch proportion to the 4th and 5th, as the 1ſt bears to the 2d and 3d. The three firſt terms are a ſuppoſition; the two laſt, a demand.

RULE 1. Let the principal cauſe of loſs or gain, intereſt or decreaſe, action or paſſion, be put in the firſt place.

2. Let that which betokeneth time, diſtance of place, and the like, be in the ſecond place, and the remaining one in the third.

3. Place the other two terms under their like, in the ſuppoſition.

4. If the blank falls under the third term, multiply the firſt and ſecond terms for a diviſor, and the other three for a dividend. But,

5. If the blank falls under the firſt or ſecond term, multiply the third and fourth terms for a diviſor, and the other three for the dividend, and the quotient will be the anſwer.

PROOF. By two ſingle rules of three.

EXAMPLES.

1. If 14 horſes eat 56 buſhels of oats in 16 days, how many buſhels will be ſufficient for 20 horſe for 24 days?

By two ſingle rules.

	hor.	bu.	hor.	bu.
1. *As*	14	: 56 : :	20	: 80
	days.	bu.	days.	bu.
2. *As*	16	: 80 : :	24	: 120

or in one ſtating, worked thus:

hor.	days.	bu.
14	: 16 :	56
20	: 24 :	—

$$\frac{56\times 20\times 24}{14\times 16}=120$$

2. If 8 men in 14 days can mow 112 acres of graſs, how many men muſt there be to mow 2000 acres in ten days?

	acres.	days.	acres.	days.
1. *As*	112	: 14 : :	2000	: 250
	days.	men.	days.	men.
2. *As*	250	: 8 : :	10	: 200

men.	days.	acres.
8	: 14 :	112
0	: 10 :	2000

$$\frac{8\times 14\times 2000}{112\times 10}=200$$

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3. If £100. in 12 months gain £6. intereſt, how much will £75. gain in 9 months? *Anſ.* 3..7..6.

4. If a carrier receives £2..2..0. for the carriage of 3 cwt. 150 miles, how much ought he to receive for the carriage of 7cwt. 3qrs. 14lb. for 50 miles? *Anſ.* 1..16..9.

5. If a regiment of ſoldiers, conſiſting of 136 men, conſume 351 quarters of wheat in 108 days, how many quarters of wheat will 11232 ſoldiers conſume in 56 days?

Anſ. 15031.

6. If 40 acres of graſs be mowed by 8 men in 7 days, how many acres can be mowed by 24 men in 28 days?

Anſ. 480.

7. If 40*s.* will pay 8 men for 5 days work, how much will pay 32 men for 24 days work? *Anſ.* £38..8..0.

8. If £100. in 12 months gain £6. intereſt, what principal will gain £3..7..6. in 9 months? *Anſ.* £75.

9. If a regiment, conſiſting of 939 ſoldiers, conſume 351 quarters of wheat in 168 days, how many ſoldiers will conſume 1404 quarters in 56 days? *Anſ.* 11268.

10. In a family, conſiſting of 7 perſons, there are drank out 2 kilderkins of beer in 12 days, how many kilderkins will there be drank out by another family of 14 perſons in 8 days?

Anſ. 2 *kil.* 12 *gal.*

11. If the carriage of 60 cwt. 20 miles coſt £14..10..0. what weight can I have carried 30 miles for £5..8..9. at the ſame rate of carriage? *Anſ.* 15 *cwt.*

12. If 2 horſes eat 8 buſhels of oats in 16 days, how many horſes will eat up 3000 quarters in 24 days? *Anſ.* 4000.

13. If £100. in 12 months gain £7. intereſt, what is the intereſt of £571. for 6 years? *Anſ.* £239..16..4$\frac{3}{4}$.

14. If I pay 10*s.* for the carriage of 2 tons 6 miles, what muſt I pay for the carriage of 12 tons, 17 cwt. 17 miles?

Anſ. £9..2..0$\frac{1}{2}$.

PRACTICE

IS ſo called from the general uſe thereof by all perſons concerned in trade and buſineſs.

All queſtions in this rule are performed by taking aliquot or even parts, by which means many tedious reductions are avoided; the table of which is as follows:

Of

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Of a Pound. s. d.	*Of a Shilling.* d.	*Of a Ton.* cwt.	*Of an Hundred.* qrs. lb.
10 .. - - - is $\frac{1}{2}$	6 is .. - - - $\frac{1}{2}$	10 - is - - $\frac{1}{2}$	2 or 56 - is $\frac{1}{4}$
6 .. - 8 - - $\frac{1}{3}$	4 - .. - - $\frac{1}{3}$	5 - - - - $\frac{1}{4}$	1 or 28 - - $\frac{1}{4}$
5 .. - - - - $\frac{1}{4}$	3 - .. - - $\frac{1}{4}$	4 - 8 - - 1	14 - - $\frac{1}{8}$
4 .. - - - - $\frac{1}{5}$	2 - .. - - $\frac{1}{6}$	2 $\frac{1}{2}$ - - - $\frac{1}{8}$	*Of a Quarter.*
3 .. 4 - - $\frac{1}{6}$	1 $\frac{1}{2}$ .. - - $\frac{1}{8}$	2 - - $\frac{1}{10}$	14 - - - - $\frac{1}{2}$
2 .. 6 - - $\frac{1}{8}$	1 - .. - $\frac{1}{12}$		7 - - - - $\frac{1}{4}$
2 .. - - - $\frac{1}{10}$			4 - - - - $\frac{1}{7}$
1 .. 8 - $\frac{1}{12}$			3 $\frac{1}{2}$ - - - $\frac{1}{8}$

RULE 1. When the price is leſs than a penny, divide by the aliquot parts that are in a penny; then by 12 and 20, it will be the anſwer.

$\frac{1}{4}$ is $\frac{1}{4}$ 5704 *lb. at* $\frac{1}{4}$

12)1426

2|0)11|8..10

£5..18..10

7695 at $\frac{1}{2}$
Facit £16 - 7$\frac{1}{2}$

5740 at $\frac{1}{2}$
Facit £11..19..2

6547 at $\frac{3}{4}$
Facit £20..9..2$\frac{1}{4}$

4573 at $\frac{3}{4}$
Facit £14..5..9$\frac{3}{4}$

RULE 2. When the price is leſs than a ſhilling, take the aliquot part or parts that are in a ſhilling, add them together, and divide by 20, as before.

1 is $\frac{1}{12}$ 7547 at 1*d.*

2|0)62|8..11

£31..8..11

6254 at 1*d*$\frac{3}{4}$
Facit £45..12..$\frac{1}{2}$

7062 at 3$\frac{3}{4}$
Facit £95..12..7$\frac{1}{2}$

1 is $\frac{1}{12}$ 3751 at 1*d*$\frac{1}{4}$.

$\frac{1}{4}$ is $\frac{1}{4}$) 312..7
78..1$\frac{3}{4}$

2|0)39|0..8$\frac{3}{4}$

£19..10..8$\frac{3}{4}$

2351 at 2*d.*
Facit £19..11..10

7210 at 2*d*$\frac{1}{4}$.
Facit £67..11..10$\frac{1}{2}$

2710 at 2*d*$\frac{1}{2}$.
Facit £28..4..7

3250 at 2*d*$\frac{3}{4}$.
Facit £37..4..9$\frac{1}{2}$

2147 at 3*d*$\frac{1}{2}$.
Facit £31..6..2$\frac{1}{2}$

7000 at 3*d*$\frac{3}{4}$.
Facit £109..7..6

3257 at 4*d.*
Facit £54..5..8

2056 at 4*d*$\frac{1}{4}$.
Facit £36..8..2

54325 at 1*d*$\frac{1}{2}$
Facit £339..10..7$\frac{1}{2}$

2715 at 3*d.*
Facit £33..18..9

3752 at 4*d*$\frac{1}{2}$.
Facit £70..7..–

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2107 at $4d\frac{3}{4}$. *Facit* £41..14..$-\frac{1}{4}$	3254 at $7d\frac{1}{4}$. *Facit* £98..5..$11\frac{1}{2}$	2150 at $9d\frac{3}{4}$. *Facit* £87..6..$10\frac{1}{2}$
3210 at $5d$. *Facit* £66..17..6	2701 at $7d\frac{1}{2}$. *Facit* £84..8..$1\frac{1}{2}$	6325 at $10d$. *Facit* £263..10..10
2715 at $5d\frac{1}{4}$. *Facit* £59..7..$9\frac{3}{4}$	8714 at $7d\frac{3}{4}$. *Facit* £119..18..$7\frac{1}{2}$	5724 at $10d\frac{1}{4}$. *Facit* £244..9..3
3120 at $5d\frac{1}{2}$. *Facit* £71..10..-	2710 at $8d$. *Facit* £90..6..8	6327 at $10d\frac{1}{4}$. *Facit* £270..4..$3\frac{3}{4}$
7521 at $5d\frac{3}{4}$. *Facit* £180..3..$9\frac{3}{4}$	3514 at $8d\frac{1}{4}$. *Facit* £120..15..$10\frac{1}{2}$	3254 at $10d\frac{1}{2}$. *Facit* £142..7..3
3271 at 6d. *Facit* £81..15..6	2759 at $8\frac{1}{2}$. *Facit* £97..14..$3\frac{1}{2}$	7291 at $10d\frac{3}{4}$. *Facit* £326..11..$6\frac{1}{4}$
7914 at $6d\frac{1}{4}$. *Facit* £206..1..$10\frac{1}{2}$	9872 at $8d\frac{3}{4}$. *Facit* 359..18..4	3256 at $11d$. *Facit* £149..4..8
3250 at $6d\frac{1}{2}$ *Facit* £88..---..5	5272 at $9d$. *Facit* £197..14..---	7254 at $11d\frac{1}{4}$. *Facit* £340..---..$7\frac{1}{2}$
2708 at $6d\frac{3}{4}$. *Facit* £76..3--3	6325 at $9\frac{1}{4}$. *Facit* £243..15..$6\frac{1}{4}$	3754 at $11d\frac{1}{2}$. *Facit* £179..17..7
3271 at $7d$. *Facit* £95..8..1	7924 at $9d\frac{1}{2}$. *Facit* £243..13..2	7972 at $11d\frac{3}{4}$. *Facit* £390..5..11

RULE 3. When the price is more than one ſhilling, and leſs than two, take the part or parts, with ſo much of the given price as is more than a ſhilling, which add to the given quantity, and divide by 20, it will give the anſwer.

$\frac{1}{2}\frac{1}{4}\frac{1}{10}$ 2106 at $12d\frac{1}{2}$. 43..$10\frac{1}{2}$	$\frac{1}{2}\frac{1}{2}\frac{1}{4}$ 3715 at $12d\frac{1}{2}$. 154..$9\frac{1}{2}$	2712 at $12\frac{1}{2}$. *Facit* £144..1..6
2|0)214|9..$10\frac{1}{2}$	2|0)386|9..$9\frac{1}{2}$	2107 at 15. $1d$.
£107..9..$10\frac{1}{2}$	£193..9..$9\frac{1}{2}$	*Facit* £114..2..7

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3215 at 1s. 1d¼.
Facit £177..9..10¾

2790 at 1s. 1d½.
Facit £156..18..9

7904 at 1s. 1d¾.
Facit £452..16..8

3750 at 1s. 2d.
Facit £218..15..--

3291 at 1s. 2d¼.
Facit £195..8..--¾

9254 at 1s. 2d½.
Facit £559..1..11

7250 at 1s. 2d¾.
Facit £445..11..5½

7591 at 1s. 3d.
Facit £474..8..9

6325 at 1s. 3d¼.
Facit £401..18..--¼

5271 at 1s. 3d½.
Facit £340..8..4½

3254 at 1s. 3d¾.
Facit £213.10.10½

2915 at 1s. 4d.
Facit £194..6..8

3270 at 1s. 4d¼.
Facit £221..8..1d½

7059 at 1s. 4d½.
Facit £485..6..1½

2750 at 1s. 4d¾.
Facit £191..18..6½

3725 at 1s. 5d.
Facit £263..17..1

7250 at 1s. 5d¼.
Facit £521..1..10½

2597 at 1s. 5d½.
Facit £189..7..3½

7210 at 1s. 5d¾.
Facit £533..4..9½

7524 at 1s. 6d.
Facit £564..6..--

7103 at 1s. 6d¼.
Facit £540..2..5¾

3254 at 1s. 6d½.
Facit £250..16..7

7925 at 1s. 6d¾.
Facit £619..2..9¾

9271 at 1s. 7d.
Facit £733..19..1

7210 at 1s. 7d¼.
Facit £578..6..-½

2310 at 1s. 7d½.
Facit £187..13..9

2504 at 1s. 7d¾.
Facit £206..1..2

7152 at 1s. 8d.
Facit £596..-

2905 at 1s. 8d¼.
Facit £245..2..2¼

7104 at 1s. 8d½.
Facit £606..16..-

1004 at 1s. 8d¾.
Facit £86..16..1

2104 at 1s. 9d.
Facit £184..2..-

2571 at 1s. 9d¼.
Facit £227..12..9¾

2104 at 1s. 9d½.
Facit 183..9..8

7506 at 1s. 9d¾.
Facit £680..4..7½

1071 at 10s. 10d.
Facit £98. 3..6

5200 at 1s. 10d¼.
Facit £482..1..8

2117 at 1s. 10d½.
Facit £198..9..4½

1007 at 1s. 10d¾.
Facit £95..9..1¼

5000 at 1s. 11d.
Facit £479..3..4

2105 at 1s. 11d¼.
Facit £203..18..5d¼

1006 at 1s. 11½.
Facit £98..10..1

2705 at 1s. 11d¾.
Facit £267..13..7¾

5000 at 1s. 11½.
Facit £489..11..8

4000 at 1s. 11d¾.
Facit £395..16..8

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RULE 4. When the price consists of any even number of shillings under 20, multiply the given quantity by half the price, doubling the first figure of the product for shillings, and the rest of the product will be pounds.

2750 at 2s. *Facit* £275..-..-	2102 at 10s. *Facit* £1051..-..-	1075 at 16s. *Facit* £860..-..
3254 at 4s. *Facit* £650..16..-	2101 at 12s. *Facit* £1260..12..-	1621 at 18s. *Facit* £1458..18..-
2710 at 6s. *Facit* £813..-..-	5271 at 14s. *Facit* £3689..14..-	Note. *When the price is* 10s. *take half of the quantity, and if any remains, it is* 10s.
1572 at 8s. *Facit* £628..-16..-	3123 at 16s.. *Facit* £2498..8..-	

RULE 5. When the price consists of odd shillings, multiply the given quantity by the price, and divide by 20, the product will be the answer.

2703 at 1s. *Facit* £135..3..-	2715 at 7s. *Facit* £950..5..-	2150 at 15s. *Facit* £1612..10..-
3270 at 3s. 3 2|0)981|0 490..10..-	3214 at 9s. *Facit* £1446..6..-	3142 at 17s. *Facit* £2670..14..-
	2710 at 11s. *Facit* £1490..10..-	2150 at 19s. *Facit* £2042..10..-
3271 at 5s. *Facit* £817..15..-	3179 at 13s. *Facit* £2066..7..-	7157 at 19s. *Facit* £6799..3..-

Note, *When the price is* 5s. *divide the quantity by* 4, *and if any remains it is* 5s.

RULE 6. When the price is shillings and pence, and they the aliquot part of a pound, divide by the aliquot part, and it will give the answer at once; but if they are not an aliquot part, then multiply the quantity by the shillings, and take parts for the rest, add them together, and divide by 20.

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s. d. 6..8	$\frac{1}{3}$	2710 at 6*s.* 8*d.* *Facit* £903..6..8
		3150 at 3*s.* 4*d.* *Facit* £525..0..0
		2715 at 2*s.* 6*d.* *Facit* £339..7..6
		7150 at 1*s.* 8*d.* *Facit* £595..16..8
		3215 at 1*s.* 4*d.* *Facit* £214..6..8
		7211 at 1*s.* 3*d.* *Facit* £450..13..9
d. 2	$\frac{1}{6}$	2710 at 3*s.* 2*d.* 3 8130 451..8 2|0 858|1..8 £429..1..8
		7514 at 4*s.* 7*d.* *Facit* £1721..19..2
		2517 at 5*s.* 3*d.* *Facit* £660..14. 3
		2547 at 7*s.* 3½*d.* *Facit* £928.11.10½
		3271 at 5*s.* 9¼*d.* *Facit* £943.16.4¾
		2103 at 15*s.* 4½*d.* *Facit* £1616.13.7½
		7152 at 17*s.* 6¾*d.* *Facit* £6280..7..0
		2510 at 14*s.* 7¼*d.* *Facit* £1832.16.5½
		3715 at 9*s.* 4½*d.* *Facit* £1741.8.1½
		2572 at 13*s.* 7*d*½. *Facit* £1752..3..6
		7251 at 14*s.* 8¼*d.* *Facit* £5324.19.0¾
		3210 at 15*s.* 7¾*d.* *Facit* £2511.3.1½
		2710 at 19*s.* 2½*d.* *Facit* £2602.14.7

RULE 7. 1*st*, When the price is pounds and ſhillings, multiply the quantity by the pounds, and proceed with the ſhillings, if they are even as in the 4th rule; if odd, take the aliquot parts, add them together, the ſum will be the anſwer.

2*dly*, When pounds, ſhillings and pence, and the ſhillings and pence the aliquot parts of a pound, multiply the quantity by the pounds, and take parts for the reſt.

3*dly*, When the price is pounds, ſhillings, pence, and farthings, and the ſhillings and pence not the aliquot parts of

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of a pound, reduce the pounds and ſhillings into ſhillings, multiply the quantity by the ſhillings, take parts for the reſt, add them together, and divide by 20.

Note. *When the given quantity is no more than three figures, proceed as in* Compound Multiplication.

4	⅕	7215 at £7..4..0 7
		50505 1443
		51948£.
s. d.		
2..6	⅛	2104 at £5..3..0 5
		10520
6	⅓	263 52.12
		10835. 12
		2107 at £2..8..0 *Facit* £5056.16.0
		7156 at £5..6..0 *Facit* £37926.16.0
6	½	2710 at £2..3..7½ 43
		116530
1½	¼	1355 338..9
	2⁄0	11822|3..9
		£5911..3..9
		3215 at £1..7..0 *Facit* £5947..15..0

2107 at £1..13..0 *Facit* £3476..11..0
3215 at £4..6..8 *Facit* £13931.13.4
2154 at £7..1..3 *Facit* £15212.12.6
2701 at £2..3..4 *Facit* £5852..3..4
2715 at £1..17..2½ *Facit* £5051..0..7½
2157 at £3..15..2¼ *Facit* £8108.19.5¼
3210 at £1.18.6¼ *Facit* £6189.5.7½
2157 at £2..7..4½ *Facit* £5109.7.10½
142 at £1..15..2¼ *Facit* £250..2..6½
95 at £15..14..7¼ *Facit* £1494.7.4¾
37 at £1..19..5¾ *Facit* £73..0..8¾
2175 at £2.15.4½ *Facit* £6022.0.7½
2150 at £17.16.1½ *Facit* £38283..8..9

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RULE 8. When the price and quantity given are of several denominations, multiply the price by the integers, and take part with the parts of the integers for the rest.

1. At £3..17..6. *per* cwt. what is the value of 25 cwt. 2 qrs. 14 lb. of tobacco?

2	½	£3 .. 17 .. 6	5×5=25
		5	
		19 .. 7 .. 6	
		5	
lb.		96 .. 17 .. 6	
14	¼	1 .. 18 .. 9	
		9 .. 8¼	
		99 .. 5 .. 11¼	

2. At £1..4..9. *per* cwt. what comes 17 cwt. 1 qr. 17 lb. of cheese to? *Anſ.* £21..10..8.

3. Sold 85 cwt. 1 qr. 10 lb. of cheese, at £1..7..8. *per* cwt. what does it come to? *Anſ.* 118..1..0½.

4. Hops at £4..5..8. *per* cwt. what muſt be given for 72 cwt. 1 qr. 18 lb? *Anſ.* £310..3..2.

5. At £1..1..4. *per* cwt. what is the value of 27 cwt. 2 qrs. 15 lb. of Malaga raiſins? *Anſ.* 29..9..6¼.

6. Bought 78 cwt. 3 qrs. 12 lb. of currants, at £2..17..9. *per* cwt. what did I give for the whole? *Anſ.* £227.14..0.

7. Sold 56 cwt. 1 qr. 17 lb. of ſugar, at £2..15..9. the cwt. what does it come to? *Anſ.* 157..4..4¼.

8. Tobacco at £3..17..10. the cwt. what is the worth of 97 cwt. 15 lb.? *Anſ.* 378..0..3.

9. At £4..14..6. the cwt. what is the value of 37 cwt. 2 qrs. 13 lb. of double refined ſugar? *Anſ.* £177..14..8½.

10. Bought ſugar at £3..14..6. the cwt. what did I give for 15 cwt. 1 qr. 10 lb.? *Anſ.* £57..2..9.

11. At £4..15..4. the cwt. the value of 172 cwt. 3 qrs. 12 lb. of tobacco is required? *Anſ.* 823..19..0½.

12. Soap at £3..11..6. the cwt. what is the value of 53 cwt. 17 lb.? *Anſ.* £190..0..4.

INTEREST.

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INTEREST.

INTEREST is either SIMPLE or COMPOUND.

SIMPLE INTEREST.

IS the PROFIT allowed in lending or forbearance of any ſum of money, for a determined ſpace of time.

The PRINCIPAL is the money lent, for which intereſt is to be received.

The RATE PER CENT. is a certain ſum agreed on between the Borrower and Lender, to be paid for every £100. for the uſe of the Principal 12 months.

The AMOUNT is the Principal and Intereſt added together.

INTEREST is alſo applied to Commiſſion, Brokage, Purchaſing of Stocks, and Inſurance.

To find the Intereſt of any Sum of Money for a Year.

RULE. Multiply the Principal by the Rate *per* Cent. that product divided by 100, will give the intereſt required.

For ſeveral Years.

Multiply the Intereſt of one year by the number of Years given in the queſtion, and the product will be the anſwer.

EXAMPLES.

1. What is the intereſt of £375. for a year, at 5 *per cent. per annum?*

5

18 | 75

20.

15 | 00 *Anſ.* £18..15..0.

2. What is the intereſt of £268. for one year, at 4 *per cent. per annum?* *Anſ.* £10..14..4$\frac{3}{4}$.

3. What is the intereſt of £945..10..0. for a year, at 4 *per cent. per annum?* *Anſ.* £37..16..4$\frac{3}{4}$.

4. What is the intereſt of £547..15..0. at 5 *per cent. per annum*, for 3 years? *Anſ.* £82..3..3.

5. What

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5. What is the Intereſt of £254..17..6. for 5 years, at 4 *per cent. per annum?* *Anſ.* £50..19.6.

6. What is the intereſt of £556..13..4. at 5 *per cent. per annum,* for 5 years? *Anſ.* £139..3..4.

COMMISSION

Is an allowance from merchants to their factors or correſpondents, in the buying or ſelling of goods, and is generally at a certain rate per cent. according to the cuſtom of the country where the factor reſides.

RULE. Multiply the principal by the rate per cent. as before; and for ¼, ½, or ¾, take the part or parts from the Principal, which added to the product, and divided by 100, will give the anſwer.

7. What is the commiſſion of £287..10..–. at 3½ *per cent?*

¼, ½, 287..10
3 *Anſ.* £10..1..3.

862..10=3
143..15= ½

10|06..5=3½
20

125
12

3|00

8. What muſt I allow my correſpondent for diſburſing on my account £529..18..5. at 2½ *per cent.?*
Anſ. £11..18..5½.

9. My correſpondent writes me word, that he has bought goods to the amount of £754..16..–. on my account, what does his commiſſion come to at 2½ *per cent.?*
Anſ. £18..17..4½.

10. If I allow my factor 3½ *per cent.* for commiſſion, what may he demand on the laying out £876..5..10?
Anſ. £32..17..2½.

PURCHASING of STOCKS.

RULE. Multiply the ſum to be purchaſed by the exceſs above 100; divide that product by 100, the produce of which, added to the given ſum, is the purchaſe required.

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If under Par, (that is under £100.) multiply by the Rate per Cent. that product, divided by 100, gives the purchase thereof.

11. What is the purchase of £575..10..–. Bank Stock, at 131¼ *per cent.?*

6×5+1=31

575..10
6

3453
5

17265..–..–=30
½ ½ 575..10..–= 1
¼ ¼ 287..15..–= ½
143..17..6= ¼

182|72.. 2..6=31¼
20

14|42
12

5|10
575..10..–
182..14..5

£758.. 4..5 *Anſ.*

12. What is the purchase of £254..17..–. Bank Annuities at 97¼ *per cent.?*

12×8+1=97

254..17
12

3058.. 4
8

24465..12..–=96
¼ ¼ 254..17..–= 1
63..14..3= ¼

247|84.. 3..3=97¼
20

16|83
12

9|99
4

3|96

£247..16..9¼ *Anſwer.*

13. At 110¼ *per cent.* what is the purchase of £2054..16..–. South Sea Stock? *Anſ.* £2265..8..4.

14. At 104⅜ *per cent.* South Sea Annuities, what is the purchase of £1797..14..–.? *Anſ.* £1876..6..11½.

15. What is the purchase of £2750..17..–. South Sea Old Annuities, at 102¾ *per cent.?* *Anſ.* £2823..1..2¼.

16. At 96¼ *per cent.* what is the purchase of £577..19..–. Bank Annuities? *Anſ.* £559..3..3¾.

17. At 124⅛ *per cent.* what is the purchase of £758..17..10. India Stock? *Anſ.* £945..15..4¼.

BROKAGE

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BROKAGE

Is an allowance to brokers, for helping merchants or factors to persons to buy or sell them goods.

RULE. Divide the sum given by 100, and take parts from the quotient with the rate per cent.

18. If I employ a broker to sell goods for me, to the value of £2575..17..6, what is the brokage, at 4*s.* *per cent.*?

```
2575..17.
  20                4s. 1/5 25..15..2
----                        ----------
1517                Ans.  £5..3..1/4
  12
----
 2|10
----
```

19. What is the brokage of £796..14..7. at 6*s.* *per cent.*? *Ans.* £2..7..9½.

20. When a broker sells goods to the amount of £7105..5..10. what may he demand for brokage, if he is allowed 5*s.* 6*d.* *per cent.*? *Ans.* £19..10..9¼.

21. If a broker is employed to buy a quantity of goods, to the value of £975..6..4. what is the brokage at 6*s.* 6*d.* *per cent.*? *Ans.* £3..3..4½.

When the time is ¼, ½, or ¾ of a year, besides a number of years given.

RULE. Take parts of the interest for one year, which add to the interest of the several years given, and it will give the answer.

22. What is the interest of £554..10..–. for 3 months, at 4 *per cent. per annum*?

```
      554..10
          4
      -------
      22|18..–
        20
      -------
       3 60
         12
      -------
m.     7|20
3 ¼    22..3..7
      ---------
Ans.  5..10..10¾
```

23. What is the interest of £336..15..6. for 2 years ¾, at 5 *per cent. per annum*?

```
336..15..6
         5
----------
16|83..17..6
  20
-------
16|77
  12
-------
 9|30
   4
-------
 1|20
```

```
      16..16..9¼
               2
      ----------
      33..13..6½
½ ½ 8..8..4½
¼ ½ 4..4..2¼
      ----------
Ans.  46..6..1¼
```


24. What

24. What is the intereſt of £325..7..6. at 6 *per cent. per annum*, for 3 years and a half? *Anſ.* £68..6..6.

25. What is the intereſt of £547..2..4. for 5 years and a half, at 4 *per cent. per annum?* *Anſ.* £120..7..3¾.

26. What is the intereſt of £257..5..1. at 4 *per cent.* for a year and three quarters? *Anſ.* £18..–..1½.

27. What is the intereſt of £479..5..–. for 5 years 1 quarter, at 5 *per cent. per annum?* *Anſ.* £125..16..–¾.

When the rate per cent. is ¼, ½, or ¾, *more than the pounds given in the rate*, proceed as in commiſſion, and it will give the anſwer for one year; and, for ſeveral, proceed as in the laſt rule.

28. What is the intereſt of £175..17..–. for 2 years and 3 quarters, at 4½ *per cent. per annum?*

½ ½ 175..17
4
703.. 8..–
87..18..6
7|91..6..6
20
18|26
12
3|18

½ ½ 7..18..3
2
15..16..6
¼ ¼ 3..19..1½
1..19..6¾
£ 21..15..2¼ *Anſ.*

29. What is the intereſt of £397..9..5, for 2 years and 1 quarter at 3½ *per cent. per annum?* *Anſ.* £31..6..–.

30. What is the intereſt of £576..2..7. for 7 years and 1 quarter, at 4½ *per cent. per annum?* *Anſ.* £187..19..1½.

31. What is the intereſt of £279..13..8. at 5¼ *per cent. per annum*, for 3 years and a half? *Anſ.* £51..7..10.

When the intereſt is required for any number of weeks.

RULE. As 52 weeks are to the intereſt of the given ſum or a year: ſo are the weeks given, to the intereſt required.

32. What

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32. What is the interest of £379..13..2. for four weeks, at 4 *per cent. per annum?*

w.	£.	s.	d.	w.
As 52 :	15	.. 3	.. 8½	:: 4 :

20
303
12
3644
4
14578
4
4)
52)58312(1121
52
12)280¼
63
52
2|0)2|3..4¼
111
104
72
52
20

379..13..2
4
15|18..12..8
20
3|72
12
8|72
4
2,88

Or thus: multiply by the number of weeks, and divide the product by 4 and 13, being 4×13=52 13)15..3..8½

1..3..4¼

N. B. *As it is 4 weeks, I don't multiply, but only divide by* 13.

33. What is the interest of £259..13..5. for 20 weeks, at 5 *per cent. per annum?* *Anſ.* £4..19..10¼.

34. What is the amount of £375..6..1. for 12 weeks, at 4½ *per cent. per annum?* *Anſ.* £379..4..0¼.

35. What is the amount of £256..5..3. for 25 weeks, at 2¾ *per cent. per annum?* *Anſ.* £259..13..0.

When the interest is for any number of days.

RULE. Multiply the pence of the principal by the days and rate *per cent.* for a dividend, cut off two figures on the right hand, and divide by 365, the quotient will be the anſwer in pence. Or,

As 365 days are to the interest of the given ſum for a year: ſo are the days given, to the interest required.

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36. What is the interest of £240. for 120 days, at 4 *per cent. per annum?*

```
          240
          240
        -----
        57600
          120
      -------
      6912000
            4
      -------- 12)
365)276480|00(757
    2555   -----
    ----   2|0)6|3..1
    2098   -----
    1825   £3..3..1¼
    ----
    2730
    2555
    ----
     175
       4
    ----
    )700(1
    365
    ----
    335
```

Or thus:

```
240 As 365:9..12::120
  4          20
 ---        ---
 9|60       192
  20        120
 ----      ----- 2|0)
12,00  365)23040(6|3
           2190 -----
           ----£3:3:1¼
           1140
           1095
           ----
             45
             12
           ----
           )540(1
            365
           ----
            175
              4
           ----
           )700(1
            365
           ----
            335
```

37. What is the interest of £379..5..4. for three years and 75 days, at 5 *per cent. per annum?* *Ans.* £60..15..8.

38. At 5½ *per cent. per annum*, what is the interest of £985..2..7. for 5 years, 127 days? *Ans.* £289..15..3.

39. What is the interest of £2726..1..4. at 4½ *per cent. per annum*, for 3 years, 154 days? *Ans.* £419..15..6¼.

When the amount, time, and rate per cent. *are given, to find the principal.*

RULE. As the amount of £100. at the rate and time given: is to £100:: so is the amount given; to the principal required.

40. What

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40. What principal being put to intereſt will amount to £402..10..0 in 5 years, at 3 *per cent, per annum?*

$3 \times 5 + 100 = £115 : 100 : : 402..10$

20 20

2300 8050

100

23|00)8050,00(£350. *Anſ.*

41. What principal being put to intereſt for 9 years will amount to £734..8..0 at 4 *per cent. per annum? Anſ.* £540

42. What principal being put to intereſt for 7 years, at 5 *per cent. per annum*, will amount to £334..16..0? *Anſ.* £248

When the principal, rate per cent. *and amount are given, to find the time.*

RULE. As the intereſt of the principal for 1 year: is to 1 year: ſo is the whole intereſt to the time required.

43. In what time will £350 amount to £402..10..0 at 3 *per cent. per annum?*

350 As 10..10.. : 1 : : 52..10 : 5

3 20 20

10|50 210 21|0)105|0(5 *years Anſ.* 402..10

20 105 350.. 0

10|00 52..10

44. In what time will £540. amount to £734..8..0. at 4 *per cent. per annum? Anſ.* 9 *years.*

45. In what time will £248. amount to £334..16..0. at 5 *per cent. per annum? Anſ.* 7 *years.*

When the principal, amount, and time are given, to find the rate per cent.

RULE. As the principal: is to the intereſt for the whole time: ſo is £100: to the intereſt for the ſame time. Divide that intereſt by the time, and the quotient will be the rate *per cent.*

46. At

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46. At what rate *per cent.* will £350. amount to £402..10..0. in 5 years time?

```
350          As 350 : 52..10 : : 100 : £15.
-------              20
52..10..0          ----
                   1050
                    100
                  -----
                35|0)10500|0(300s. £15÷5=3 per cent.
```

47. At what rate *per cent.* will £248. amount to £334..16..0. in 7 years time? *Ans.* 5 *per cent.*

48. At what rate *per cent.* will £540. amount to £734..8..0. in 9 years time? *Ans.* 4 *per cent.*

Compound INTEREST

IS that which arises both from the principal and interest; that is, when the interest on money becomes due, and not paid, the same interest is allowed on that interest unpaid, as was on the principal before.

RULE 1. Find the first year's interest, which add to the principal: then find the interest of that sum, which add as before, and so on for the number of years.

2. Subtract the given sum from the last amount, and it will give the compound interest required.

EXAMPLES.

1. What is the compound interest of £500. forborne 3 years, at 5 *per cent. per annum?*

```
500   500          525
  5    25          26..5
-----  ----       -----
25|00  525 1st year. 551..5 2d year.
         5              5
       ----         -----
       26|25        27|56..5        551..  5
         20            20           27..11..3
       ----         -----         ---------
       5|00.         11|25         578..16..3 3d year.
                       12          500        prin. sub.
                     -----         ---------
                      3|00           78..16..3=interest
                                          for 3 years.
```

2. What is the amount of £400. forborne $3\frac{1}{2}$ years, at 6 *per cent. per annum*, compound interest? *Ans.* £490..13..$11\frac{1}{4}$.

3. What

3. What will £650. amount to in 5 years, at 5 *per cent. per annum*, compound intereſt? *Anſ.* £829..11..7½.

4. What is the amount of £550..10..0. for 3 years and 6 months, at 6 *per cent. per annum*, compound intereſt? *Anſ.* £675..6..5.

5. What is the compound intereſt of £764. for 4 years and 9 months, at 6 *per cent. per annum?* *Anſ.* £243..18..8.

6. What is the compound intereſt of £75..10..6. for 5 years, 7 months and 15 days, at 5 *per cent. per annum?* *Anſ.* £18..3..8¼.

7. What is the compound intereſt of £259..10..0. for 3 years, 9 months and 10 days, at 4½ *per cent. per annum?* *Anſ.* £46..19..10½.

REBATE *or* DISCOUNT

IS the abating ſo much money on a debt, to be received before it is due, as that money, if put to intereſt, would gain in the ſame time, and at the ſame rate. As £100. preſent money would diſcharge a debt of £105. to be paid a year to come, rebate being made at 5 *per cent.*

RULE. As £100. with the intereſt for the time given: is to that intereſt:: ſo is the ſum given: to the rebate required.

Subtract the rebate from the given ſum, and the remainder will be the preſent worth.

EXAMPLES.

1. What is the diſcount and preſent worth of £487..12. for 6 months, at 6 *per cent. per annum?*

6*m* ½6

3
100
103

487..12
14..4

Anſ. 473..8..0 *preſent worth.*

As 103 : 3 :: 487..12
20 20
2060 9752
3
£. ſ.
206'0)2925|6(14..4 *rebate.*
206
865
824
416=4ſ.

2. What

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2. What is the present payment of £357..10..0. which was agreed to be paid 9 months hence, at 5 *per cent. per annum?* *Anſ.* £344..11..7.

3. What is the diſcount of £275..10..0. for 7 months, at 5 *per cent. per annum?* *Anſ.* £7..16..1¼.

4. Bought goods to the value of £109..10..0. to be paid at 9 months, what preſent money will diſcharge the ſame, if I am allowed 6 *per cent. per annum* diſcount?

Anſ. £104..15..8½.

5. What is the preſent worth of £527..9..1. payable 7 months hence, at 4¼ *per cent.?* *Anſ.* £514..13..10¼.

6. What is the diſcount of £85..10..0. due September the 8th, this being July the 4th, rebate at 5 *per cent. per annum?*

Anſ. 15*s.* 3*d*¼.

7. Sold goods for £875..5..6. to be paid 5 months hence, what is the preſent worth at 4½ *per cent.?*

Anſ. £859..3..4.

8. What is the preſent worth of £500. payable in 10 months, at 5 *per cent. per annum?* *Anſ.* £480.

9. How much ready money can I receive for a note of £75. due 15 months hence, at 5 *per cent.?*

Anſ. £70..11..9¼.

10. What will be the preſent worth of £150. payable at 3 four months; *i. e.* one third at 4 months, one third at 8 months, and one third at 12 months, at 5 *per cent.* diſcount?

Anſ. £145..3..9¼.

11. Sold goods to the value of £575..10..0. to be paid at two 3 months, what muſt be diſcounted for preſent payment, at 5 *per cent.?* *Anſ.* £10..11..4¼.

12. What is is the preſent worth of £500. at 4 *per cent.* £100. being to be paid down, and the reſt at two 6 months?

Anſ. £488..7..9.

EQUATION of PAYMENTS

IS when ſeveral ſums are due at different times, to find a mean time for paying the whole debt: to do which, this is the common.

RULE. Multiply each term by its time, and divide the ſum of the products by the whole debt, the quotient is accounted the mean time.

EXAMPLES.

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EXAMPLES.

1. A owes B £200. whereof £40 is to be paid at 3 months, £60 at 5 months, and £100 at 10 months; at what time may the whole debt be paid together, without prejudice to either?

£.		m.	
40	×	3 =	120
60	×	5 =	300
100	×	10 =	1000
		200)	1420

7 *months* $\frac{20}{100}$.

2. B owes C £800. whereof £200 is to be paid at 3 months, £100 at 4 months, £300 at 5 months, and £200 at 6 months; but they agreeing to make but one payment of the whole, I demand what that time must be?

Anſ. 4 *months*, 18 *days.*

3. I bought of K a quantity of goods to the value of £360. which was to have been paid as follows: £120 at 2 months, £200 at 4 months, and the reſt at 5 months; but we afterwards agreed to have it paid at one mean time; the time is demanded. *Anſ.* 3 *months*, 13 *days.*

4. A merchant bought goods to the value of £500. to pay £100 at the end of 4 months, £150 at the end of 6 months, and £250 at the end of 12 months; but afterwards they agreed to diſcharge the debt at one payment; at what time was this payment made? *Anſ.* 8 *months*, 12 *days.*

5. H is indebted to L a certain ſum, which is to be paid at 6 different payments, that is $\frac{1}{4}$ at 2 months, $\frac{1}{8}$ at 3 months, $\frac{1}{8}$ at 4 months, $\frac{1}{4}$ at 5 months, $\frac{1}{8}$ at 6 months, and the reſt at 7 months; but they agree that the whole ſhall be paid at one equated time, what is that time?

Anſ. 4 *months, one quarter.*

6. A is indebted to B £120. whereof $\frac{1}{2}$ is to be paid at 3 months, $\frac{1}{4}$ at 6 months, and the reſt at 9 months, what is the equated time of the whole payments?

Anſ. 5 *months*, 7 *days.*

BARTER

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BARTER

IS the exchanging one commodity for another, and informs the traders so to proportion their goods, that neither may sustain loss.

RULE 1*st*. Find the value of that commodity whose quantity is given; then find what quantity of the other, at the rate proposed, you may have for the same money.

2*dly*. When one has goods at a certain price, *ready money*, but in Bartering advances it to something more, find what the other ought to rate his goods at, in proportion to that advance, and then proceed as before.

EXAMPLES.

1. What quantity of chocolate, at 4s. per lb. must be delivered in barter for 2cwt. of tea, at 9s. per lb.?

2cwt.
112

224
9

4|2016 *the value of the tea.*
---
504 lb. *of chocolate.*

2. A and B barter; A hath 20 cwt. of prunes, at 4d. per lb. ready money, but in barter will have 5d. per lb. and B hath hops worth 3 2s. per cwt. ready money; what ought B to rate his hops at in barter, and what quantity must be given for the 20 cwt. of prunes?

112 As 4 : 5 : : 32
20 5
---
s. 2240 4)160
40 5 ---
12 *cwt. qr. lb.* 40 *S.*
48|0)1120|0(23 : 1 : 9$\frac{16}{48}$ *Ans.*
96

160
144

16=1 *qr.* 9 *lb.* $\frac{16}{48}$

3. How

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3. How much tea, at 9*s.* per lb. can I have in barter for 4 cwt. 2 qrs. of chocolate, at 4*s.* per lb. ? *Anſ.* 2 *cwt.*

4. Two merchants barter: A hath 20 cwt. of cheeſe, at 21*s.* 6*d.* per cwt. B hath 8 pieces of Iriſh cloth, at £3..14..0. per piece; I deſire to know who muſt receive the difference, and how much ?

Anſ. B muſt receive of A £8..2..0.

5. A and B barter: A hath $3\frac{1}{2}$ lb. of pepper, at $13d\frac{1}{2}$. per lb. B hath ginger, at $15d\frac{1}{4}$. per lb. how much ginger muſt he deliver in barter for the pepper ? *Anſ.* 3 *lb.* 1 *oz.* $\frac{35}{61}$.

6. How many dozen of candles, at 5*s.* 2*d.* per dozen, muſt be delivered in barter for 3 cwt. 2 qrs. 16 lb. of tallow, at 37*s.* 4*d.* per cwt. ? *Anſ.* 26 *doz.* 3 *lb.*

7. A hath 608 yards of cloth, worth 14*s.* per yard, for which B giveth him £125..12..0. in ready money, and 85 cwt. 2 qrs. 24 lb. of bees-wax. The queſtion is, what did B reckon his bees-wax at per cwt, ? *Anſ.* £3..10..0.

8. A and B barter: A hath 320 dozen of candles, at 4*s.* 6*d.* per dozen; for which B giveth him £30. in money, and the reſt in cotton, at 8*d.* per lb. I deſire to know how much cotton B gave A beſides the money ?

Anſ. 11 *cwt.* 1 *qr.*

9. If B hath cotton, at 1*s.* 2*d.* per lb. how much muſt he give A for 114 lb. of tobacco, at 6*d.* per lb. ?

Anſ. 48 *lb.* $\frac{12}{14}$.

10. C hath nutmegs worth 7*s.* 6*d.* per lb. ready money, but in barter will have 8*s.* per lb. and D hath leaf tobacco worth 9*d.* per lb. ready money, how much muſt D rate his tobacco at per lb. that his profit may be equivalent with C's ?

Anſ. $9d\frac{1}{2}$. $\frac{36}{40}$.

PROFIT AND LOSS

IS a rule that diſcovers what is got or loſt in the buying or ſelling of goods, and inſtructs us to riſe or fall the price, ſo as to gain or loſe ſo much *per cent.* or otherwiſe.

The queſtions in this rule are performed by the Rule of Three.

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EXAMPLES.

1. If a yard of cloth is bought for 11*s.* and ſold for 12*s.* 6*d.* what is the gain *per cent.* ?

As 11 : 1 .. 6 : : 100

12	20
18	2000
12..6	18
11..0	11)36000
1..6	12)3272
	2|0)27|2..8

Anſ. 13..12..8$\frac{8}{11}$.

2. If 60 ells of holland coſt £18. what muſt 1 ell be ſold for to gain 8 *per cent.* ?

As 100 : 18 : : 108

108

12×5=60

1'00)19'44

20 12)19.8.9½

8|80 5)1.12.4½

12 6..5½

9,60

4

2|40

Anſ. 6*s.* 5*d*½.

3. If 1 lb. of tobacco coſt 16*d.* and is ſold for 20*d.* what is the gain *per cent.* ? *Anſ.* £25.

4. If a parcel of cloth be ſold for £560. and at £12. *per cent.* gain, what was the prime coſt ? *Anſ.* £500.

5. If a yard of cloth is bought for 13*s.* 4*d.* and ſold again for 16*s.* what is the gain *per cent.* ? *Anſ.* £20.

6. If 112 lb. of iron coſt 27*s.* 6d. what muſt 1 cwt. be ſold for to gain 15 *per cent.* ? *Anſ.* £1..11..7½.

7. If 375 yards of broad cloth be ſold for £490. and 20 *per cent.* profit, what did it coſt *per* yard ? *Anſ.* £1..1..9½.

8. Sold 1 cwt. of hops for £6..15..0. at the rate of 25 *per cent.* profit, what would have been the gain *per cent.* if I had ſold them for £8. *per* cwt. ? *Anſ.* £48..2..11½.

9. If 90 ells of cambrick coſt £60. how muſt I ſell it *per* yard to gain £18. *per cent.* ? *Anſ.* 12*s.* 7*d.*

10. A plumber ſold 10 fother of lead for £204..15..0. (the fother being 19 cwt. ½) and gained after the rate of £12..10. 0. *per cent.* what did it coſt him *per* cwt. ?

Anſ. 18*s.* 8*d.*

11. Bought 436 yards of cloth, at the rate of 8*s.* 6*d.* *per* yard, and ſold it for 10*s.* 4*d.* *per* yard, what was the gain of the whole ? *Anſ.* £39..19..4.

12. Paid £69. for one ton of ſteel, which is retailed at 6*d.* *per* lb. what is the profit or loſs by the ſale of 14 tons ?

Anſ. £182. *loſs.*

13. Bought

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13. Bought 124 yards of linen for £32. how ſhould the ſame be retailed *per* yard to gain £15. *per cent.*?

Anſ. 5s. 11d. $\frac{28}{124}$.

14. Bought 249 yards of cloth, at 3s. 4d. *per* yard, retailed the ſame at 4s. 2d. *per* yard, what is the profit in the whole, and how much *per cent.*?

Anſ. £10..7..6. *profit, and* 25 *per cent.*

FELLOWSHIP

IS when two or more join their ſtock and trade together, ſo to determine each perſon's particular ſhare of the gain or loſs, in proportion to his principal in the joint ſtock.

By this rule a bankrupt's eſtate may be divided amongſt his creditors; as alſo legacies may be adjuſted when there is a deficiency of aſſets or effects.

FELLOWSHIP *is either with or without* TIME.

FELLOWSHIP *without* TIME.

RULE. As the whole ſtock: is to the whole gain or loſs: : ſo is each man's ſhare in ſtock: to his ſhare of the gain or loſs.

PROOF. Add all the ſhares together, and the ſum will be equal to the given gain or loſs—but the ſureſt way is, as the whole gain or loſs: is to the whole ſtock: : ſo is each man's ſhare of the gain or loſs: to his ſhare in ſtock.

EXAMPLES.

1. Two merchants trade together; A put into ſtock £20. and B £40. they gained £50. what is each perſon's ſhare thereof?

20+40=60

As 60 : 50 : : 20 — 20 — 6|0)100|0 — £16..13..4.

As 60 : 50 : : 40 — 40 — 6|0)200|0 — £33..6..8. B's *ſhare.*

16..13..4 A's.

50..0..0.

2. Three

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2. Three merchants trade together, A, B, and C; A put in £20. B £30. and C £40. they gained £180. what is each man's part of the gain? *Anſ.* A £40. B £60. C £80.

3. A, B, and C, enter into partnerſhip: A puts in £364. B £482. and C £500. and they gained £867. what is each man's ſhare in proportion to his ſtock?

Anſ. A £234..9..3¼—*rem.* 70. B £310..9..5—*rem.* 248
C £322..1..3½—*rem.* 1028.

4. Four merchants, B, C, D, and E, made a ſtock? B put in £227. C £349. D £115. and E £439. in trading they gained £428. I demand each merchant's ſhare of the gain?

Anſ. B £85..19..6¾—690. C £132..3..9—120.
D £43..11..1¾—250. E £166..5..6¼—70.

5. Three perſons, D, E, and F, join in company; D's ſtock was £750. E's £460. and F's £500. and at the end of 12 months they gained £684. what is each man's particular ſhare of the gain? *Anſ.* D £300. E £184. and F £200.

6. A merchant is indebted to B £275..14..0. to C £304..7..0. to D £152. and to E £104..6..0. but upon his deceaſe, his eſtate is found to be worth but £675..15..0. how muſt it be divided among his creditors?

Anſ. B's £222..15..2—6584. C's £245..18..1½—15750.
D's £122..16..2¾—12227, and E's £84..5..5—15620.

7. Four perſons trading together in a joint ſtock, of which A has ⅓, B ¼, C ⅕, and D ⅙, and at the end of 6 months they gain £100. what is each man's ſhare of the ſaid gain?

Anſ. A £35..1..9—48. B £26..6..3¾—36. C £21..1..0½.
—120, and D £17..10..10½.—24.

8. Two perſons purchaſed an eſtate of £1700. *per annum* freehold, for £27200. when money was at 6 *per cent.* intereſt, and 4*s.* per pound land-tax, whereof D paid £15000. and E the reſt; ſome time after the intereſt of the money falling to 5 *per cent.* and 2*s.* per pound land-tax, they ſell the ſaid eſtate for 24 years purchaſe; I deſire to know each perſon's ſhare? *Anſ.* D £22500. E £18300.

9. D, E, and F, join their ſtocks in trade; the amount of their ſtock is £647. and are in proportion as 4, 6 and 8 are to one another, and the amount of this gain is equal to D's ſtock; what is each man's ſtock and gain?

D's *ſtock*,	£143..15..6½ 2/3	*gain*, £31..19..0.—184036
E's - - -	215..13..4	47..18..6—414080.
F's - - - -	287..11..1¼ 1/8	63..18..0—506098

10. D,

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10. D, E, and F, join ſtocks in trade: the amount of their ſtocks was £100. D's gain £3. E's £5. and F's £8. what was each man's ſtock?

Anſ. D's ſtock £18..15..0. *E's* £31..5..0. *and F's* £50.

FELLOWSHIP with TIME.

RULE. As the ſum of the products of each man's money and time: is to the whole gain or loſs: : ſo is each man's product: to his ſhare of the gain or loſs.

PROOF. As in Fellowſhip without Time.

EXAMPLES.

1. D and E enter into partnerſhip; D puts in £40. for three months, and E £75. for four months, and they gained £70. What is each man's ſhare of the gain?

Anſ. D. £20. *E.* £50.

$40\times3=120$ As 420 : 70 : : 120 As 420 : 70 : : 300
$75\times4=300$ 120 300

420 | 42|0)840|0(20 | 42|0)2100|0(50

2. Three merchants join in company: D puts in ſtock £195..14..0. for 3 months, E £169..18..3. for 5 months, and F £59..14..10. for 11 months, they gained £364..18..0. What is each man's part of the gain?

Anſ. D's £102..6..4.—5008. *E's* £148..1..1½—4828024 *and F's* £114..10..6¼—14707.

3. Three merchants join in company for 18 months: D put in £500. and at five months end took out £200; at 10 months end put in £300. and at the end of 14 months takes out £130. E puts in £400. and at the end of 3 months, £270 more; at 9 months he takes out £140 but puts in £100. at the end of 12 months, and withdraws £99 at the end of 15 months. F puts in £900. and at 6 months took out £200; at the end of 11 months put in £500. but takes out that and £100. more at the end of 13 months. They gained £200. I deſire to know each man's ſhare of the gain?

Anſ. D £50..7..6—21720. *E* £62..12..5¼—29859. *and F* £87..0..0¼—14167.

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4. D, E, and F, hold a piece of ground in common, for which they are to pay £36..10..6. D puts in 23 oxen 27 days; E 21 oxen 35 days; and F 16 oxen 23 days. What is each man to pay of the said rent?

Anſ. D £13..3..1½—624. E £15..11..5—1688. *and* F £7..15..11—1136.

ALLIGATION.

ALLIGATION *is either* MEDIAL *or* ALTERNATE.

ALLIGATION MEDIAL.

IS when the price and quantities of ſeveral ſimples are given to be mixed, to find the mean price of that mixture.

RULE. As the whole compoſition : is to its total value : : ſo is any part of the compoſition : to its mean price.

PROOF. Find the value of the whole mixtue at the mean rate, and if it agrees with the total value of the ſeveral quantities at their reſpective prices, the work is right.

EXAMPLES.

1. A farmer mixed 20 buſhels of wheat, at 5*s.* *per* buſhel, and 36 buſhels of rye, at 3*s.* *per* buſhel, with 40 buſhels of barley at 2*s.* *per* buſhel. I deſire to know the worth of a buſhel of this mixture.

20 × 5 =	100	As 96 : 288 : : 1 : 3.
36 × 3 =	108	
40 × 2 =	80	
—	—	*Anſ.* 3*s.*
96	288	

2. A vintner mingles 15 gallons of Canary, at 8*s.* *per* gallon, with 20 gallons, at 7*s.* 4*d.* *per* gallon, 10 gallons of ſherry at 6*s.* 8*d.* *per* gallon, and 24 gallons of white wine, at 4*s.* *per* gallon. What is the worth of a gallon of this mixture? *Anſ.* 6*s.* 2*d*½. $\frac{46}{69}$.

3. A grocer mingled 4 cwt. of ſugar, at 56*s.* *per* cwt. 7 cwt. at 43*s.* *per* cwt. and 5 cwt. at 37*s.* *per* cwt. I demand the price of 2 cwt. of this mixture? *Anſ.* £4..8..9.

4. A

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4. A maltſter mingles 30 quarters of brown malt, at 28*s.* *per* quarter, with 46 quarters of pale, at 30*s.* *per* quarter, and 24 quarters of high-dried ditto, at 25*s.* *per* quarter. What is the value of 8 buſhels of this mixture?

Anſ. £1..8..2¼. $\frac{6}{150}$.

5. If I mix 27 buſhels of wheat, at 5*s.* 6*d.* *per* buſhel, with the ſame quantity of rye, at 4*s.* *per* buſhel, and 14 buſhels of barley at 2*s.* 8*d.* *per* buſhel, what is the worth of a buſhel of this mixture? *Anſ.* 4*s.* 3*d*¼. $\frac{28}{68}$.

6. A grocer mingled 3 cwt. of ſugar, at 56*s.* *per* cwt. 6 cwt. at £1..17..4. *per* cwt. and 3 cwt. at £3..14..8 *per* cwt. What is 1 cwt. of this mixture worth?

Anſ. £2..11..4.

7. A mealman has flour of ſeveral ſorts, and would mix 3 buſhels, at 3*s.* 5*d.* *per* buſhel, 4 buſhels, at 5*s.* 6*d.* *per* buſhel, and 5 buſhels at 4*s.* 8*d.* *per* buſhel. What is the worth of a buſhel of this mixture? *Anſ.* 4*s.* 7*d*½. $\frac{4}{12}$.

8. A vintner mixes 20 gallons of Port, at 5*s.* 4*d.* *per* gallon, with 12 gallons of white wine, at 5*s.* *per* gallon, 30 gallons of Liſbon, at 6*s.* *per* gallon, and 20 gallons of mountain, at 4*s.* 6d. *per* gallon. What is a gallon of this mixture worth? *Anſ.* 5*s.* 3*d*¼. $\frac{50}{82}$.

9. A farmer mingled 20 buſhels of wheat, at 5*s.* *per* buſhel, and 36 buſhels of rye, at 3*s.* *per* buſhel, with 40 buſhels of barley, at 2*s.* *per* buſhel. I deſire to know the worth of a buſhel of this mixture? *Anſ.* 3*s.*

10. A perſon mixing a quantity of oats, at 2*s.* 6*d.* *per* buſhel, with the like quantity of beans, at 4*s.* 6*d.* *per* buſhel, would be glad to know the price of one buſhel of that mixture? *Anſ.* 3*s.* 6*d.*

11. A refiner having 12 lb. of ſilver bullion, of 6 oz. fine, would melt it with 8lb. of 7 oz. fine, and 10 lb. of 8 oz. fine, required the fineneſs of 1 lb. of that mixture?

Anſ. 6 *oz.* 18 *dwt.* 16 *gr.*

12. If with 40 buſhels of corn, at 4*s.* *per* buſhel, there are mixed 10 buſhels, at 6*s.* *per* buſhel, 30 buſhels, at 5*s.* *per* buſhel, and 20 buſhels, at 3*s.* *per* buſhel, what will 10 buſhels of that mixture be worth? *Anſ.* £2..3..0.

13. A tobacconiſt would mix 50 lb. of tobacco, at 11*d.* *per* lb. with 30 lb. at 14*d.* *per* lb. 25 lb. at 22*d.* *per* lb. and 37 lb. at 2*s.* *per* lb. What will 1 lb. of this mixture be worth?

Anſ. 16*d*¾. $\frac{112}{142}$.

ALLIGA-

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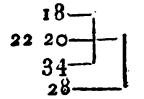
ALLIGATION ALTERNATE

Is when the price of several things are given, to find such quantities of them to make a mixture, that may bear a price propounded.

In ordering the rates and given price, observe,

1. Place them one under the other, and the propounded price or mean rate at the left hand of them, thus



2. Link the several rates together, by 2 and 2, always observing to join a greater and a less than the mean.

3. Against each extreme place the difference of the mean and its yoke-fellow.

When the prices of the several simples and the mean rate are given without any quantity, to find how much of each simple is required to compose the mixture.

RULE. Take the difference between each price and the mean rate, and set them alternately, they will be the answer required.

PROOF. By Alligation Medial.

EXAMPLES.

1. A vintner would mix four sorts of wines together, of 18*d.* 20*d.* 24*d.* and 28*d.* per quart, what quantity of each must he take to sell the mixture at 22*d.* per quart?

Answer.		*Proof.*
18	2 of 18*d.* =	36*d.*
20	6 of 20*d.* =	120
24	4 of 24*d.* =	96
28	2 of 28*d.* =	56
	14	)308
		22*d.*

Or thus.		*Proof.*
18	6 of 18*d.* =	108*d.*
20	2 of 20*d.* =	40
24	2 of 24*d.* =	48
28	4 of 28*d.* =	112
	14	)308
		22*d.*

Note. *Questions in this Rule admit of a great variety of* answers, *according to the manner of linking them.*

2. A grocer would mix sugar, at 4*d.* 6*d.* and 10*d.* *per* lb. so as to sell the compound for 8*d.* *per* lb. What quantity of each must he take? *Ans.* 2 *lb.* *at* 4*d.* 2 *lb.* *at* 6*d.* *and* 6*lb.* *at* 10*d.*

3. I desire

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3. I desire to know how much tea, at 16*s.* 14*s.* 9*s.* and 8*s.* *per* lb. will compose a mixture worth 10*s.* *per* lb.?

Anſ. 1 *lb. at* 16*s.* 2 *lb. at* 14*s.* 6 *lb. at* 9*s. and* 4 *lb. at* 8*s.*

4. A farmer would mix as much barley at 3*s.* 6*d.* *per* buſhel, rye at 4*s.* *per* buſhel, and oats at 2*s.* *per* buſhel, as to make a mixture worth 2*s.* 6*d.* *per* buſhel. How much is that of each ſort? *Anſ.* 6 *of barley*, 6 *of rye*, *and* 30 *of oats.*

5. A grocer would mix raiſins of the ſun at 7*d.* *per* lb. with Malaga's, at 6*d.* and Smyrna's at 4*d.* *per* lb. I deſire to know what quantity of each ſort he muſt take to ſell them at 5*d.* *per* lb.? *Anſ.* 1 *lb. of raiſins of the ſun*, 1 *lb. of Malaga's, and* 3 *lb. of Smyrna's.*

6. A tobacconiſt would mix tobacco of 2*s.* 1*s.* 6*d.* and 1*s.* 3*d.* *per* lb. ſo as the compound may bear a price of 1*s.* 8*d.* *per* lb. What quantity of each ſort muſt he take?

Anſ. 7 *lb. at* 2*s.* 4 *lb. at* 1*s.* 6*d. and* 4 *lb. at* 1*s.* 3*d.*

ALTERNATION PARTIAL.

IS when the prices of all the ſimples, the quantity of but one of them, and the mean rate, are given, to find the ſeveral quantities of the reſt in proportion to that given.

RULE. Take the difference between each price, and the mean rate, as before. Then,

As the difference of that ſimple, whoſe quantity is given: is to the reſt of the differences ſeverally: : ſo is the quantity given: to the ſeveral quantities required.

EXAMPLES.

1. A tobacconiſt being determined to mix 20 lb. of tobacco, at 15*d.* *per* lb. with others at 16*d.* *per* lb. 18*d.* *per* lb. and 22*d.* *per* lb. how many pounds of each ſort muſt he take to make one pound of that mixture worth 17*d.*?

	Anſwer.	*Proof.*	
15 — 5	20 lb.	at 15*d.* = 300*d.*	As 5 : 1 : : 20 : 4
16 — 1	4 lb.	at 16*d.* = 64*d.*	As 5 : 1 : : 20 : 4
18 — 1	4 lb.	at 18*d.* = 72*d.*	As 5 : 2 : : 20 : 8
22 — 1	2 lb.	at 22*d.* = 176*d.*	
	Anſ. 36 lb.	: 612*d.* : : 1 lb. : 17*d.*	

2. A

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2. A farmer would mix 20 buſhels of wheat at 60*d.* *per* buſhel, with rye at 36*d.* barley at 24*d.* and oats at 18*d.* *per* buſhel. How much muſt he take of each ſort, to make the compoſition worth 32*d.* *per* buſhel?

Anſ. 20 *buſhels of wheat*, 35 *buſhels of rye*, 70 *buſhels of barley, and* 10 *buſhels of oats.*

3. A perſon is deſirous of mixing wheat at 4*s.* *per* buſhel, rye at 3*s.* *per* buſhel, and barley at 2*s.* *per* buſhel, with 12 buſhels of oats, at 18*d.* per buſhel. I would be glad to know how many buſhels of each ſort he muſt take to make the compoſition worth 3*s.* 6*d.* *per* buſhel?

Anſ. 96 *buſhels of wheat*, 12 *buſhels of rye*, 12 *of barley, and* 12 *of oats.*

4. A diſtiller would mix 40 gallons of French brandy, at 12*s.* *per* gallon, with Engliſh at 7*s.* and ſpirits at 4*s.* *per* gallon. What quantity of each ſort muſt he take, to afford it for 8*s.* *per* gallon?

Anſ. 40 *gallons French*, 32 *Engliſh, and* 32 *ſpirits.*

5. A grocer would mix teas of 12*s.* 10*s.* and 6*s.* with 20 lb. at 4*s.* *per* lb. How much of each ſort muſt he take to make the compoſition worth 8*s.* *per* lb.?

Anſ. 20 *lb. at* 4*s.* 10 *lb. at* 6*s.* 10 *lb. at* 10*s. and* 20 *lb. at* 12*s.*

6. A wine merchant is deſirous of mixing 18 gallons of Canary, at 6*s.* 9*d.* *per* gallon, with Malaga at 7*s.* 6*d.* *per* gallon; ſherry at 5*s.* *per* gallon; and white wine, at 4*s.* 3*d.* *per* gallon. How much of each ſort muſt he take, that the mixture may be ſold for 6*s.* *per* gallon?

Anſ. 18 *gallons of Canary*, 31½ *of Malaga*, 13½ *of ſherry, and* 27 *of white wine.*

ALTERNATION TOTAL

Is when the price of each ſimple, the quantity to be compounded, and the mean rate are given, to find how much of each ſort will make that quantity.

RULE. Take the difference between each price, and the mean rate, as before; then,

As the ſum of the difference: is to each particular difference:: ſo is the quantity given: to the quantity required.

EXAMPLES.

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EXAMPLES.

1. A grocer has four ſorts of ſugar, *viz.* 12*d.* 10*d.* 6*d.* and 4*d. per* lb. and would make a compoſition of 144 lb. worth 8*d. per* lb. I deſire to know what quantity of each he muſt take?

		Anſwer.	*Proof.*	
12	4	4 - - 48 at	12*d.* 576	As 12 : : : 144 : 48
8 10	2	2 - - 24 at	10*d.* 240	As 12 : 2 : : 144 : 24
6	2	2 - - 24 at	6*d.* 144	
4	4	4 - - 48 at	4*d.* 142	
	12	144	(1152(8*d.*	

2. A druggiſt having four ſorts of tea, of 5*s.* 6*s.* 8*s.* and 9*s. per* lb. would have a compoſition of 87 lb. worth 7*s. per* lb. What quantity muſt there be of each?

Anſ. 14½ *lb. of* 5*s.* 29 *lb.* 6*s.* 29 *lb. of* 8*s. and* 14½ *of* 9*s.*

3. A vintner had four ſorts of wine, *viz.* white wine, at 4*s. per* gallon; Flemiſh, at 6*s. per* gallon; Malaga, at 8*s. per* gallon; and Canary, at 10*s. per* gallon: would make a mixture of 60 gallons, to be worth 5*s. per* gallon. What quantity of each muſt he take?

Anſ. 45 *gallons of white wine,* 5 *gallons of Flemiſh,* 5 *gallons of Malaga, and* 5 *gallons of Canary.*

4. A grocer having four ſorts of currants, of 11*d.* 9*d.* 6*d.* and 4*d. per* lb. is deſirous of making a compoſition of 240 lb. worth 8*d. per* lb. How much of each muſt he take?

Anſ. 96 *lb. at* 11*d.* 48 *lb. at* 9*d.* 24 *lb. at* 6*d. and* 72 *lb. at* 4*d.*

5. A ſilverſmith hath four ſorts of gold, *viz.* of 24 carats fine, of 22, 20, and 15 carats fine; would mix as much of each ſort together, ſo as to have 42 oz. of 17 carats fine. How much muſt he take of each?

Anſ. 4 *of* 24, 4 *of* 22, 4 *of* 20, *and* 30 *of* 15 *carats fine.*

6. A druggiſt having ſome drugs of 8*s.* 5*s.* and 4*s. per* lb. made them into two parcels; one of 28 lb. at 6*s. per* lb. the other of 42 lb. at 7*s. per* lb. How much of every ſort did he take for each parcel?

Anſ. 12 *lb. of* 8*s.*	*Anſ.* 30 *lb. of* 8*s.*
8 *lb. of* 5*s.*	6 *lb. of* 5*s.*
8 *lb. of* 4*s.*	6 *lb. of* 4*s.*
28 *lb. at* 6*s. per lb.*	42 *lb. at* 7*s. per lb.*

POSITION,

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POSITION, *or the* RULE OF FALSE,

IS a rule that, by false or supposed numbers, taken at pleasure, discovers the true one required. It is divided into two parts; SINGLE and DOUBLE.

SINGLE POSITION

Is, by using one supposed number, and working with it as the true one, you find the real number required, by the following

RULE. As the total of the errrors : to the true total : : so is the supposed number : to the true one required.

PROOF. Add the several parts of the sum together, and, if it agrees with the sum, it is right.

EXAMPLES.

1. A schoolmaster being asked how many scholars he had, said, if I had as many, half as many, and one quarter as many more, I should have 88. How many had he? *Ans.* 32.

Suppose he had -	40	As 110 : 88 : : 40	32
as many - -	40	40	32
half as many	20		16
¼ *as many* -	10	11|0)352|0(32	8
	110		88 *proof.*

2. A person having about him a certain number of Portugal pieces, said, if the third, fourth, and sixth of them were added together, they would make 54. I desire to know how many he had? *Ans.* 72.

3. A gentleman bought a chaise, horse and harness, for £60. the horse came to twice the price of the harness, and the chaise to twice the price of the horse and harness. What did he give for each?

Ans. Horse £13..6..8. *Harness* £6..13..4. *Chaise* £40.

4. A, B and C being determined to buy a quantity of goods, which would cost them £120. agreed amongst themselves that B should have a third part more than A, and C a fourth part more than B. I desire to know what each man must pay? *Ans. A* £30. *B* £40. *C* £50.

5. A man

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5. A man overtaking a maid driving a flock of geese, said to her, How do you do, sweetheart? where are you going with these 30 geese? No, Sir, said she, I have not 30; but if I had as many more, half as many more, and 5 geese besides, I should have 30. How many had she?

Ans. 10.

6. A person delivered to another a sum of money, unknown, to receive interest for the same, at 6 *per cent. per annum*, simple interest, and at the end of ten years received for principal and interest £300. What was the sum lent?

Ans. £187..10..0.

DOUBLE POSITION

Is by making use of two supposed numbers, and if both prove false, (as it generally happens) they are with their errors to be thus ordered.

RULE 1. Place each error against its respective position.

2. Multiply them cross-ways.

3. If the errors are alike, *i. e.* both greater, or both less than the given number, take their difference for a divisor, and the difference of their products for a dividend. But if unlike, take their sum for a divisor, and the sum of their products for a dividend, the quotient will be the answer.

EXAMPLES.

1. A, B, and C, would divide £200. between them, so that B may have £6. more than A, and C £8. more than B. How much must each have?

Suppose A had 40	*Then suppose A had* 50
then B had 46	*then B must have* 56
and C - - 54	*and C* - - - - 64
140 *too little by* 60.	170 *too little by* 30.

Sup. errors.

40 X 60
50 30

3000 1200
1200

3|0)180|0
60 *Ans. for A.*

60
30
—
30 *divisor.*

60 *A*
66 *B*
74 *C*
—
200 *proof.*

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2. A man had 2 silver cups, of unequal weight, having one cover to both, of 5 oz. now if the cover is put on the lesser cup, it will double the weight of the greater cup; and set on the greater cup, it will be thrice as heavy as the lesser cup. What is the weight of each cup?

Ans. 3 *ounces lesser*; 4 *greater.*

3. A, B, and C, playing at hazard together, the money staked was 196 guineas; but disagreeing, each seized as many as he could: A got a certain quantity; B as many as A, and 16 more; and C the 6th part of both their sums. How many had each? *Ans.* A 76, B 92, *and* C 28.

4. A gentleman bought a house with a garden, and a horse in the stable, for £500. now he paid 4 times the price of the horse for the garden, and 5 times the price of the garden for the house. What was the value of the house, garden, and horse, separately?

Ans. horse £20. *garden* 80, *house* 400.

5. Three persons discoursed concerning their ages; says H, I am 30 years of age; says K, I am as old as H; and $\frac{4}{5}$ of L; and says L, I am as old as you both.. What was the age of each person?

Ans. H 30; K 50; *and* L 80.

6. D, E, and F, playing at cards, staked 324 crowns; but disputing about the tricks, each man took as many as he could: D got a certain number; E as many as D, and 15 more; and F got a 5th part of both their sums added together. How many did each get?

Ans. D 127$\frac{1}{2}$; E 142$\frac{1}{2}$; *and* F 54.

7. A, stealing apples was taken by B, and to appease him gave him half of what he had, and B gives him back 10; going farther he meets C, who took from him half of what he had left, and gives him back 4: after that, meeting with D, he gives him half of what he had, and he returns him back 1; at last getting safe away, he finds he had 13 left. How many had he at first? *Ans.* 60.

8. A gentleman going into a garden, meets with some ladies, and says to them, Good morning to you 10 fair maids. Sir, you mistake, answered one of them, we are not 10; but if we were twice as many more as we are, we should be as many above 10 as we are now under. How many were they? *Ans.* 5.

EXCHANGE

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EXCHANGE

IS the receiving money in one country for the same value paid in another.

The Par of Exchange is always fixed and certain, it being the intrinsic value of foreign money, compared with sterling; but the Course of Exchange rises and falls, upon various occasions.

I. FRANCE.

They keep their accounts at Paris, Lyons, and Rouen, in livres, sols, and deniers, and exchange by the crown, =4*s.* 6*d.* at par.

NOTE. 12 *deniers make* 1 *sol.*
20 *sols* - - - 1 *livre.*
3 *livres* - - - 1 *crown.*

To change French into Sterling.

RULE. As 1 crown : is to the given rate : : so is the French sum : to the sterling required.

To change Sterling into French.

RULE. As the rate of exchange : is to 1 crown : : so is the sterling sum : to the French required.

EXAMPLES.

1. How many crowns must be paid at Paris, to receive in London £180. exchange, at 4*s.* 6*d.* per crown?

d. *c.* £.
As 54 : 1 : : 180 :
240
crowns.
54)43200(800
432
...

2. A merchant at Paris remits to his correspondent in London 800 crowns, at 4*s.* 6*d.* each; what is the value in sterling?

cr. *d.* *cr.*
1 : 54 : : 800 :
54
12)43200
20)3600
£180.

3. How much sterling must be paid in London, to receive in Paris 758 crowns, exchange at 56*d.* per crown?

Ans. £176..17..4.

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4. A merchant in London remits £176..17..4. to his correſpondent at Paris? what is the value of French crowns, at 56*d.* per crown? *Anſ.* 758.

5. Change 725 crowns, 17 ſols, 7 deniers, at 54*d.* ½ per crown, into ſterling, what is the ſum? *Anſ.* £164. 14..0½.

6. Change £164..14..0½. ſterling into French crowns, exchange at 54*d.* ½ per crown?

Anſ. 725 *crowns*, 17 *ſols*, 7 *deniers*.

II. SPAIN.

They keep their accounts at Madrid, Cadiz, and Seville, in dollars, rials, and maravedies, and exchange by the piece of eight=4*s.* 6*d.* at par.

NOTE. 34 *maravedies make* 1 *rial.*
8 *rials* - - - - - 1 *piaſtre, or piece of eight.*
10 *rials* - - - - - 1 *dollar.*

RULE. As with France

EXAMPLES.

7. A merchant at Cadiz remits to London 2547 pieces of eight, at 56*d.* per piece, how much ſterling is the ſum?

Anſ. £594..6..0.

8. How many pieces of eight, at 56*d.* each, will anſwer a bill of £594..6..0. ſterling? *Anſ.* 2547.

9. If I pay a bill here of £2500. what Spaniſh money may I draw my bill for at Madrid, exchange at 57*d.* ½ per piece of eight? *Anſ.* 10434 *pieces of eight*, 6 *rials*, 8 *mar.*

III. ITALY.

They keep their accounts at Genoa and Leghorn, in livres, ſols, and deniers, and exchange by the piece of eight, or dollars=4*s.* 6*d.* at par.

NOTE. 12 *deniers make* 1 *ſol.*
20 *ſols* - - - - 1 *livre.*
5 *livres* - - - - 1 *piece of eight* at Genoa.
6 *livres* - - - - 1 *piece of eight* at Leghorn.

N. B. The exchange at Florence is by ducatoons; the exchange at Venice by ducats.

NOTE. 6 *ſolidi make* 1 *groſs.*
24 *groſs* - - 1 *ducat.*

RULE. The ſame as before.

10. How

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10. How much ſterling money may a perſon receive in London, if he pays in Genoa 976 dollars, at 53*d.* per dollar? *Anſ.* £215..10..8.

11. A merchant remitted £215..10..8. ſterling to Leghorn, how many dollars will he receive there, the exchange being at 53*d.* per dollar? *Anſ.* 976.

12. A factor hath ſold goods at Florence, for 250 ducatoons, at 54*d.* each, what is the value in pounds ſterling? *Anſ.* £56..5..--.

13. A bill of £56..5..--. is remitted to Florence to be paid in ducatoons, at 54*d.* each, how many will be received? *Anſ.* 250.

14. If 275 ducats, at 4*s.* 5*d.* each, be remitted from Venice to London, what is the value in pounds ſterling? *Anſ.* £60..14..7.

15. A gentleman travelling, would exchange £60..14..7. ſterling for Venice ducats, at 4*s.* 5*d.* each, how many muſt he receive? *Anſ.* 275.

IV. PORTUGAL.

They keep their accounts at Oporto and Liſbon, in *reas*, and exchange on the *milrea*=6*s.* 8*d.* ½ at par.

NOTE. 1000 *reas* make 1 *milrea.*

RULE. The ſame as with France.

EXAMPLES.

16. A gentleman being deſirous to remit to his correſpondent in London 2750 milreas, exchange at 6*s.* 5*d. per* milrea, how much ſterling will he be creditor for in London? *Anſ.* £882..5..10.

17. If a bill be drawn from London of £882..5..10. ſterling, how many milreas, at 6*s.* 5*d.* each, is equal in value to the ſaid ſum? *Anſ.* 2750.

18. A merchant at Oporto remits to London 4366 milreas, and 183 reas, at 5*s.* 5*d.* ⅝ exchange *per* milrea, how much ſterling muſt be paid in London for this remittance? *Anſ.* £1193..17..6¾.

19. If I pay a bill at London of £1193..17..6¾. what muſt I draw for on my correſpondent at Liſbon, exchange at 5*s.* 5*d.* ⅝ *per* milrea? *Anſ.* 4366 *milreas*, 183 *reas.*

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V. HOLLAND, FLANDERS, *and* GERMANY.

They keep their accounts at Antwerp, Amſterdam, Bruſſels, Rotterdam, and Hamburgh; ſome in pounds, ſhillings, and pence, as in England: others in guilders, ſtivers, and pennings; and exchange with us in our pound, at 33*s.* 4*d.* Flemiſh, at par.

NOTE. 8 *pennings* - *make* 1 *groat.*
2 *groats or* 16 *pennings* 1 *ſtiver.*
20 *ſtivers* - - - - - 1 *guilder or florin.*

ALSO

12 *groats or* 6 *ſtivers* - *make* 1 *ſchelling.*
20 *ſchellings or* 6 *guilders* - 1 *pound.*

To change Flemiſh *into* Sterling.

RULE. As the given rate : is to 1 pound : : ſo is the Flemiſh ſum : to the ſterling required.

To change Sterling *into* Flemiſh.

RULE. As £1 ſterling : is to the given rate : : ſo is the ſterling given : to the Flemiſh ſought.

EXAMPLES.

20. Remitted from London to Amſterdam a bill of £754..10..--. ſterling, how many pounds Flemiſh is the ſum, the exchange at 33*s.* 6*d.* Flemiſh *per* pound ſterling?

Anſ. £1263..15..9. *Flemiſh*

21. A merchant at Rotterdam remits £1263..15..9. Flemiſh to be paid in London, how much ſterling money muſt he draw for, the exchange being at 33*s.* 6*d.* Flemiſh *per* pound ſterling? *Anſ.* £754..10..--.

22. If I pay in London £852..12..6. ſterling, how many guilders muſt I draw for at Amſterdam, exchange at 34 ſchel. 4 ½ groats Flemiſh *per* pound ſterling?

Anſ. 8792 *guild.* 13 *ſtiv.* 14 ½ *pennings.*

23. What muſt I draw for at London, if I pay at Amſterdam 8792 guild. 13 ſtiv. 14 ½ pennings; exchange at 34 ſchel. 4 ½ groats *per* pound ſterling? *Anſ.* £852..12..6.

To

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To convert Bank Money into current, and the contrary.

NOTE. *The* Bank *money is worth more than the* Current. *The difference between the one and the other is called* agio, *and is generally from* 3 to 6 per cent. *in favour of the* Bank.

To change Bank *into* Current *money.*

RULE. As 100 guilders Bank : is to 100 with the agio added : : so is the Bank given : to the Current required.

To change Current *money into* Bank.

RULE. As 100 with the agio added : is to 100 Bank : : so is the Current money given : to the Bank required.

24. Change 794 guilders, 15 ſtivers, current money, into Bank florins, agio 4 $\frac{3}{8}$ *per cent.*

Anſ. 761 *guilders,* 8 *ſtivers,* 11 *pennings.*

25. Change 761 guilders, 9 ſtivers Bank, into Current money, agio 4 $\frac{3}{8}$ *per cent.*

Anſ. 794 *guilders,* 15 *ſtivers,* 4 *pennings.*

VI. IRELAND.

26. A gentleman remits to Ireland £575..15...., ſterling, what will he receive there, the exchange being at 10 *per cent.?* *Anſ.* £633..6..6.

27. What muſt be paid in London for a remittance of £633..6..6. Iriſh, exchange at 10 *per cent.?*

Anſ. £575..15....

COMPARISON *of* WEIGHTS *and* MEASURES.

EXAMPLES.

1. If 50 Dutch pence be worth 65 French pence, how many Dutch pence are equal to 350 French pence? *Anſ.* 269$\frac{5}{65}$.

2. If 12 yards at London make 8 ells at Paris, how many ells at Paris will make 64 yards at London? *Anſ.* 42$\frac{8}{11}$.

3. If 30 lb. at London make 28 lb. at Amſterdam, how many lb. at London will be equal to 350 lb. at Amſterdam?

Anſ. 375.

4. If 95 lb. Flemiſh make 100 lb. Engliſh, how many lb. Engliſh are equal to 275 lb. Flemiſh? *Anſ.* 289$\frac{45}{95}$.

CONJOINED

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CONJOINED PROPORTION

IS when the coin, weight, or measures of several countries are compared in the same question; or it is linking together a variety of proportions.

When it is required to find how many of the first sort of coin, weight, or measure, mentioned in the question, are equal to a given quantity of the last.

RULE. Place the numbers alternately, beginning at the left-hand, and let the last number stand on the left-hand; then multiply the first row continually for a dividend, and the second for a divisor.

PROOF. By as many single Rules of Three as the question requires.

EXAMPLES.

1. If 20 lb. at London make 23 lb. at Antwerp, and 155 lb. at Antwerp, make 180 lb. at Leghorn, how many lb. at London are equal to 72 lb. at Leghorn?

Left.	*Right.*	
20	23	20 × 155 × 72 223200
155	180	23 × 180 = 4140)223200(53 $\frac{378}{414}$.
72		

2. If 12 lb. at London make 10 lb. at Amsterdam, 100 lb. at Amsterdam 120 lb. at Thoulouse, how many lb. at London is equal to 40 lb. at Thoulouse? *Ans.* 40.

3. If 140 braces at Venice are equal to 156 braces at Leghorn, and 7 braces at Leghorn equal to 4 ells English, how many braces at Venice are equal to 16 ells English?

Ans. 25 $\frac{80}{624}$.

4. If 40 lb. at London make 36 lb. at Amsterdam, and 90 lb. at Amsterdam make 116 lb. at Dantzick, how many lb. at London are equal to 130 lb. at Dantzick?

Ans. 112 $\frac{288}{4176}$.

When it is required to find how many of the last sort of coin, weight, or measure, mentioned in the question, is equal to a quantity of the first.

RULE. Place the numbers alternately, beginning at the left-hand, and let the last number stand on the right-hand; then multiply the first row for a divisor, and the second for a dividend.

EXAMPLES.

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EXAMPLES.

5. If 12 lb. at London make 10 lb. at Amſterdam, 100 lb. at Amſterdam 120 lb. at Thoulouſe, how many lb. at Thoulouſe are equal to 40 lb. at London? *Anſ.* 40 lb.

6. If 40 lb. at London make 36 lb. at Amſterdam, and 90 lb. at Amſterdam 116 lb. at Dantzick, how many lb. at Dantzick are equal to 122 lb. at London? *Anſ.* $141\frac{187}{360}$.

PROGRESSION

Conſiſts of TWO PARTS,

ARITHMETICAL AND GEOMETRICAL.

ARITHMETICAL PROGRESSION

IS when the rank of numbers increaſe or decreaſe regularly by the continual adding or ſubtracting of the equal numbers: As 1, 2, 3, 4, 5, 6, are in Arithmetical Progreſſion by the continual increaſing or adding of one; 11, 9, 7, 5, 3, 1, by the continual decreaſing or ſubtracting of two.

NOTE. *When any even number of terms differ by Arithmetical Progreſſion, the ſum of the two* extremes *will be equal to the two* middle numbers, *or any two* means *equally diſtant from the* extremes: *as* 2, 4, 6, 8, 10, 12, *where* 6 + 8, *the two middle numbers, are* = 12 + 2, *the two extremes, and* = 10, + 4, *the two means,* = 14.

When the number of terms are odd, the double of the middle term *will be equal to the* two extremes, *or if any* two means *equally diſtant from the* middle term; *as* 1, 2, 3, 4, 5, *where the double of* 3 = 5 + 1 = 2 + 4 = 6.

In Arithmetical Progreſſion five things are to be obſerved, *viz.*

1. The firſt term; *better expreſſed thus,* F.
2. The laſt term - - - - L.
3. The number of terms - - N.
4. The equal difference - - D.
5. The ſum of all the terms - - S.

Any three of which being given, the other two may be found.

The

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The firſt, ſecond, and third terms given to find the fifth.

RULE. Multiply the ſum of the two extremes by half the number of terms, or multiply half the ſum of the two extremes by the whole number of terms, the product is the total of all the terms: *or thus*,

I. F. L. N. are given to find S.

$$F + L \times \frac{N}{2} = S.$$

EXAMPLES.

1. How many ſtrokes does the hammer of a clock ſtrike in 12 hours? *Anſ.* 78.

12+1=13, *then* 13×6=78.

2. A man buys 17 yards of cloth, and gave for the firſt yard 2s. and for the laſt 10s. what did the 17 yards amount to? *Anſ.* £5..2..-.

3. If 100 eggs were placed in a right line, exactly a yard aſunder from one another, and the firſt a yard from a baſket, what length of ground does that man go who gathers up theſe 100 eggs ſingly, returning with every egg to the baſket to put it in? *Anſ.* 5 *miles*, 1300 *yards*.

The firſt, ſecond, and third terms given to find the fourth.

RULE. From the ſecond ſubtract the firſt, the remainder divided by the third leſs one, gives the fourth: *or thus*,

II. F. L. N. are given to find D.

$$\frac{L.-F.}{N.-1} = D.$$

EXAMPLES.

4. A man had eight ſons, the youngeſt was 4 years old, and the eldeſt 32, they increaſe in Arithmetical Progreſſion, what was the common difference of their ages? *Anſ.* 4

32—4=28, *then* 28÷8—1=4 *common difference*.

5. A man is to travel from London to a certain place in 12 days, and to go but 3 miles the firſt day, increaſing every day by an equal exceſs, ſo that the laſt day's journey may be 58 miles, what is the daily increaſe, and how many miles diſtant is that place from London? *Anſ.* 5 *daily increaſe*.

Therefore, as three miles is the firſt day's journey,

3+ 5= 8 *the ſecond day.*
8+5=13 *the third day, &c.*

The whole diſtance is 366 *miles.*

Or thus, 58+3=61 *then* 61×6=366.

The

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The firſt, ſecond, and fourth terms given, to find the third.

RULE. From the ſecond ſubtract the firſt, the remainder divide by the fourth, and to the quotient add 1, gives the third: *or thus,*

III. F. L. D. are given to find N.

$$\frac{L-F.}{D}+1=N.$$

EXAMPLES.

6. A perſon travelling into the country, went 3 miles the firſt day, and increaſed every day by 5 miles, till at laſt he went 58 miles in one day, how many days did he travel?

Anſ. 12.

$58-3=55$, *then* $55\div5=11+1=12$ *the number of days.*

7. A man being aſked how many ſons he had, ſaid, that the youngeſt was 4 years old, and the oldeſt 32, and that he increaſed one in his family every 4 years, how many had he?

Anſ. 8.

The ſecond, third, and fourth terms given, to find the firſt.

RULE. Multiply the fourth by the third made leſs by 1, the product ſubtracted from the ſecond gives the firſt: *or thus,*

IV. L. N. D. are given to find F.

$$L-D\times N-1=F.$$

EXAMPLES.

8. A man in 10 days went from London to a certain town in the country, every day's journey increaſing the former by 4, and the laſt he went was 46 miles, what was the firſt?

Anſ. 10 *miles.*

$4\times10-1=36$, *then* $46-36=10$, *the firſt day's journey.*

9. A man takes out of his pocket at 8 ſeveral times, ſo many different numbers of ſhillings, every one exceeding the former by 6, the laſt 46, what was the firſt? *Anſ.* 4.

The fourth, third, and fifth given, to find the firſt.

RULE. Divide the fifth by the third, and from the quotient ſubtract half the product of the fourth multiplied by the third leſs 1 gives the firſt: *or thus,*

V. N. D. S. are given to find F.

$$\frac{S.}{N}-\frac{D\times N-1}{2}=F$$

EXAMPLES.

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EXAMPLES.

10. A man is to receive £360. at 12 ſeveral payments, each to exceed the former by £4. and is willing to beſtow the firſt payment on any one that can tell him what it is. What will that perſon have for his pains? *Anſ.* £8.

$$360 \div 12 = 30, \textit{ then } 30 - \frac{4 \times 12 - 1}{2} = 8 \textit{ the firſt payment.}$$

The firſt, third, and fourth given to find the ſecond.

RULE. Subtract the fourth from the product of the third, multiplied by the fourth, that remainder added to the firſt gives the ſecond: *or thus,*

VI. F. N. D. are given to find L.

$$ND - D + F = L.$$

EXAMPLES.

11. What is the laſt number of an Arithmetical Progreſſion, beginning at 6, and continuing by the increaſe of 8 to 20 places? *Anſ.* 158.

$20 \times 8 - 8 = 152$, *then* $152 + 6 = 158$ *the laſt number.*

GEOMETRICAL PROGRESSION

IS the increaſing or decreaſing of any rank of numbers by ſome common ratio; that is, by the continual multiplication or diviſion of ſome equal number: as 2, 4, 8, 16, increaſe by the multiplier 2, and 16, 8, 4, 2, decreaſe by the diviſor 2.

NOTE. *When any number of terms in continued, in geometrical progreſſion, the product of the* two extremes *will be equal to any* two means, *equally diſtant from the* extremes: as 2, 4, 8, 16, 32, 64, *where* 64×2 *are* $= 4 \times 32$, *and* $8 \times 16 = 128$.

When

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When the number of terms are odd, the middle term *multiplied into itſelf will be equal to the* two extremes, *or any* two means, *equally diſtant from the* mean: *as* 2, 4, 8, 16, 32, *where* $2\times32=4\times16=8\times8=64$.

In Geometrical Progreſſion the ſame five things are to be obſerved as in Arithmetical, *viz.*

1. The firſt term.
2. The laſt term.
3. The number of terms.
4. The equal difference or ratio.
5. The ſum of all the terms.

NOTE. *As the laſt term in a long ſeries of numbers is very tedious to come at, by continual multiplication; therefore, for the readier finding it out, there is a ſeries of numbers made uſe of in* Arithmetical Proportion, *called* indices, *beginning with an* unit, *whoſe common difference is* one; *whatever number of* indices *you make uſe of, ſet as many numbers (in ſuch* geometrical proportion *as is given in the queſtion) under them.*

As 1, 2, 3, 4, 5, 6. *Indices.*
2, 4, 8, 16, 32, 64. *Numbers in geometrical proportion.*

But if the firſt term *in* geometrical proportion *be different from the* ratio, *the* indices *muſt begin with a* cypher.

As 0, 1, 2, 3, 4, 5, 6. *Indices.*
1, 2, 4, 8, 16, 32, 64. *Numbers in geometrical proportion.*

When the indices *begin with a* cypher, *the ſum of the* indices *made choice of muſt always be one* leſs *than the number of terms given in the queſtion; for* 1 *in the* indices *is over the ſecond term, and two over the third, &c.*

Add any two of the indices *together, and that ſum will agree with the product of their reſpective terms.*

As in the firſt table of indices $2+5=7$
Geometrical proportion $4\times32=128$

Then the ſecond $2+4=6$
$4\times16=64$

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In any geometrical progreſſion proceeding from unity, the ratio being known, to find any remote term, without producing all the intermediate terms.

RULE. Find what figures of the indices added together would give the exponent of the term wanted: then multiply the numbers ſtanding under ſuch exponent into each other, and it will give the term required.

NOTE, *When the* exponent 1 *ſtands over the* ſecond term, *the number of* exponents *muſt be* 1 leſs *than the number of terms.*

EXAMPLES.

1. A man agrees for 12 peaches, to pay only the price of the laſt, reckoning a farthing for the firſt, a halfpenny for the ſecond, &c. doubling the price to the laſt, what muſt he give for them? *Anſ.* £2..2..8.

0, 1, 2, 3, 4, *Exponents.*
1, 2, 4, 8, 16, *No. of terms.*

16= 4
16= 4
256= 8
8= 3
For 4+4+3=11, *No. of terms leſs* 1.
4)2048=11 *No. of far.*
12)512
2'0)42..8
2..2..8

2. A country gentleman going to a fair to buy ſome oxen, meets with a perſon who had 23; he demanded the price of them, was anſwered £16. a piece: the gentleman bids him £15. a piece and he would buy all: the other tells him it could not be taken; but if he would give what the laſt ox would come to, at a farthing for the firſt, and doubling it to the laſt, he ſhould have all. what was the price of the oxen? *Anſ.* £4369..1..4.

In any geometrical progreſſion, not proceeding from unity, the ratio being given, to find any remote term, without producing all the intermediate terms.

RULE. Proceed as in the laſt, only obſerve, that every product muſt be divided by the firſt term.

EXAMPLES.

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EXAMPLES.

3. A ſum of money is to be divided among 8 perſons, the firſt to have £20. the ſecond £60. and ſo on in triple proportion; what will the laſt have? *Anſ.* 43740.

$$540\times540 \qquad 14580\times60$$
0, 1, 2, 3, $\frac{}{}=14580$, *then* $\frac{}{}=4374$●
20, 60, 180, 540, 20 20

$3+3+1=7$, *one leſs than the number of terms.*

4. A gentleman dying left nine ſons, to whom and to his executors he bequeathed his eſtate in manner following: To his executors £50. his youngeſt ſon was to have as much more as the executors, and each ſon to exceed the next younger by as much more; what was the eldeſt ſon's portion?

Anſ. £25600.

The firſt term, ratio, and number of terms given, to find the ſum of all the terms.

RULE. Find the laſt term as before, then ſubtract the firſt from it, and divide the remainder by the ratio, leſs one; to the quotient of which add the greater, gives the ſum required.

EXAMPLES.

5. A ſervant ſkilled in numbers agreed with a gentleman to ſerve him twelve months, provided he would give him a farthing for his firſt month's ſervice, a penny for the ſecond and 4*d.* for the third, &c. what did his wages amount to?

Anſ. £5825..8..5¼.

$256\times256=65536$ *then* $65536\times64=4194304$

$$4194304-1$$
0, 1, 2, 3, 4, $\frac{}{}=1398101$, *then*
1, 4, 16, 64, 256,

$4+4+3=11$, *No. of terms leſs* 1. $4-1$.

$1398101+4194304=5592405$ farthings.

6. A man bought a horſe, and by agreement was to give a farthing for the firſt nail, three for the ſecond, &c. there were four ſhoes, and in each ſhoe 8 nails; what was the worth of the horſe? *Anſ.* £9651146816 93..13..4.

7. A certain perſon married his daughter on New-year's day, and gave her huſband 1*s.* towards her portion, promiſing to double it on the firſt day of every month for one year; what was her portion? *Anſ.* £204..15..--.

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8. A laceman, well verſed in numbers, agreed with a gentleman to ſell him 22 yards of rich gold brocade lace, for 2 pins the firſt yard, 6 pins the ſecond, &c. in triple proportion; I deſire to know what he ſold the lace for, if the pins were valued at 100 for a farthing; alſo what the laceman got or loſt by the ſale thereof, ſuppoſing the lace ſtood him in £7. per yard?

Anſ. The lace ſold for £326886..–..9.
Gain £32732..–..9.

PERMUTATION

IS the changing or varying the order of things.

RULE. Multiply all the given terms one into another, and the laſt product will be the number of changes required.

EXAMPLES.

1. How many changes may be rung upon 12 bells; and how long would they be ringing but once over, ſuppoſing 10 changes might be rung in 1 minute, and the year to contain 365 days, 6 hours?

Anſwer.

1×2×3×4×5×6×7×8×9×10×11×12=479001600 *changes, which* ÷ 10=47900160 *minutes; and, if reduced, is* =91 *years,* 3 *weeks,* 5 *days,* 6 *hours.*

2. A young ſcholar coming into town for the convenience of a good library, demands of a gentleman with whom he lodged, what his diet would coſt for a year, who told him £10. but the ſcholar not being certain what time he ſhould ſtay, aſked him what he muſt give him for ſo long as he ſhould place his family, conſiſting of 6 perſons beſides himſelf, in different poſitions, every day at dinner: the gentleman thinking it would not be long, tells him £5. to which the ſcholar agrees. What time did the ſcholar ſtay with the gentleman?

Anſ. 5040 *days.*

THE

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THE

TUTOR's ASSISTANT.

PART II.

VULGAR FRACTIONS.

A FRACTION is a part or parts of an unit, and written with two figures, with a line between them, as $\frac{1}{4}$, $\frac{5}{6}$, $\frac{3}{8}$, &c.

The figure above the line is called the numerator, and the under one the denominator; which shews how many parts the unit is divided into; and the numerator shews how many of those parts are meant by the fraction.

There are four sorts of vulgar fractions; *proper*, *improper*, *compound*, and *mixed*, viz.

1. A PROPER FRACTION is when the numerator is less than the denominator, as $\frac{2}{4}$, $\frac{3}{6}$, $\frac{7}{8}$, $\frac{9}{11}$, $\frac{101}{115}$, &c.

2. An IMPROPER FRACTION is when the numerator is equal to, or greater than the denominator, as $\frac{4}{3}$, $\frac{8}{4}$, $\frac{12}{12}$, $\frac{207}{52}$, &c.

3. A COMPOUND FRACTION is the fraction of a fraction, and known by the word *of*, as $\frac{1}{2}$ *of* $\frac{2}{3}$ *of* $\frac{7}{9}$, *of* $\frac{8}{17}$, *of* $\frac{9}{12}$, &c.

4. A MIXED NUMBER OR FRACTION is compoſed of a whole number and fraction, as $8\frac{3}{7}$, $17\frac{1}{2}$, $8\frac{31}{97}$, &c.

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REDUCTION *of* VULGAR FRACTIONS.

1. *TO reduce fractions to a common denominator.*

RULE 1. Multiply each numerator into all the denominators, except its own, for a new numerator; and all the denominators for a common denominator. Or,

2. Multiply the common denominator by the several given numerators separately, and divide the product by their several denominators, the quotient will be the new numerators.

EXAMPLES.

1. Reduce $\frac{2}{4}$ and $\frac{4}{7}$ to a common denominator.
Facit $\frac{14}{28}$, *and* $\frac{16}{28}$,

1st num. *2d num.*
$2\times7=14$ $4\times4=16$, *then* $4\times7=28$ *den.* $=\frac{14}{28}$, *and* $\frac{16}{28}$.

2. Reduce $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{5}{8}$ to a common denominator.
Facit $\frac{32}{64}$, $\frac{48}{64}$, $\frac{40}{64}$.

3. Reduce $\frac{7}{8}$, $\frac{4}{6}$, $\frac{6}{10}$, and $\frac{5}{7}$ to a common denominator.
Facit $\frac{2940}{3360}$, $\frac{2240}{3360}$, $\frac{2016}{3360}$, $\frac{2880}{3360}$.

4. Reduce $\frac{6}{10}$, $\frac{2}{4}$, $\frac{1}{7}$, $\frac{3}{6}$ to a common denominator.
Facit $\frac{1008}{1680}$, $\frac{840}{1680}$, $\frac{240}{1680}$, $\frac{840}{1680}$.

5. Reduce $\frac{4}{5}$, $\frac{2}{3}$, $\frac{3}{7}$, and $\frac{1}{8}$ to a common denominator.
Facit $\frac{672}{840}$, $\frac{560}{840}$, $\frac{360}{840}$, $\frac{105}{840}$.

6. Ruduce $\frac{2}{6}$, $\frac{5}{9}$, $\frac{2}{8}$, and $\frac{3}{5}$ to a common denominator.
Facit $\frac{720}{2160}$, $\frac{1200}{2160}$, $\frac{540}{2160}$, $\frac{1296}{2160}$.

2. *To reduce a vulgar fraction to its lowest terms.*

RULE. Find a common measure by dividing the lower term by the upper, and that divisor by the remainder following, till nothing remain; the last divisor is the common measure; then divide both parts of the fraction by the common measure, and the quotient will give the fraction required.

Note. *If the common measure happen to be one, the fraction is already in its lowest term; and when a fraction hath cyphers at the right hand, it may be abreviated by cutting them off; as* $\frac{210}{60}$.

EXAMPLE.

7. Reduce $\frac{24}{32}$ to its lowest terms.

24)32(1
24
———
Common measure 8)24(3
24
———

then 8)$\frac{24}{32}$($=\frac{3}{4}$ *Facit.*

8. Reduce

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8. Reduce $\frac{30}{125}$ to its loweſt terms. *Facit* $\frac{6}{25}$.
9. Reduce $\frac{2008}{6884}$ to its loweſt terms. *Facit* $\frac{52}{171}$.
10. Reduce $\frac{1923}{5766}$ to its loweſt terms. *Facit* $\frac{1}{3}$.
11. Reduce $\frac{8250}{9600}$ to its loweſt terms. *Facit* $\frac{55}{64}$.
12. Reduce $\frac{5184}{6912}$ to its loweſt terms. *Facit* $\frac{3}{4}$.

3. *To reduce a mixed number to an improper fraction.*

RULE. Multiply the whole number by the denominator of the fraction, and to the product add the numerator for a new numerator, which place over the denominator.

Note, *To expreſs a whole number fraction-ways, ſet* 1 *for the denominator given.*

EXAMPLES.

13. Reduce $83\frac{3}{7}$ to an improper fraction. *Facit* $1\frac{29}{7}$.
$18\times 7+3=129$ *new numerator,* $\frac{129}{7}$.
14. Reduce $56\frac{1}{22}$ to an improper fraction. *Facit* $1\frac{245}{22}$.
15. Reduce $183\frac{5}{21}$ to an improper fraction. *Facit* $3\frac{848}{21}$.
16. Reduce $13\frac{4}{5}$ to an improper fraction. *Facit* $\frac{69}{5}$.
17. Reduce $27\frac{2}{9}$ to an improper fraction. *Facit* $\frac{245}{9}$.
18. Reduce $514\frac{5}{16}$ to an improper fraction. *Facit* $8\frac{229}{16}$.

4. *To reduce an improper fraction to its proper terms.*

RULE. Divide the upper term by the lower.

EXAMPLES.

19. Reduce $\frac{129}{7}$ to its proper terms. *Facit* $18\frac{3}{7}$.
$129\div 7=18\frac{3}{7}$.
20. Reduce $\frac{1245}{22}$ to its proper terms. *Facit* $56\frac{13}{22}$.
21. Reduce $\frac{3848}{21}$ to its proper terms. *Facit* $183\frac{5}{21}$.
22. Reduce $\frac{69}{5}$ to its proper terms. *Facit* $13\frac{4}{5}$.
23. Reduce $\frac{245}{9}$ to its proper terms. *Facit* $27\frac{2}{9}$.
24. Reduce $\frac{8229}{16}$ to its proper terms. *Facit* $514\frac{5}{16}$.

5. *To reduce a compound fraction to a ſingle one.*

RULE. Multiply all the numerators for a new numerator, and all the denominators for a new denominator.

Reduce the new fraction to its loweſt terms, by RULE 2.

EXAMPLES.

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EXAMPLES.

25. Reduce $\frac{2}{3}$ of $\frac{3}{5}$ of $\frac{5}{8}$ to a single fraction.

Facit $\frac{2\times3\times5=30}{3\times5\times8=120}$ *reduced to the lowest term* $=\frac{1}{4}$

26. Reduce $\frac{5}{9}$ of $\frac{4}{7}$ of $\frac{1}{2}\frac{1}{2}$ to a single fraction.

Facit $\frac{220}{756}=\frac{55}{189}$.

27. Reduce $\frac{1}{1}\frac{1}{2}$ of $\frac{1}{1}\frac{1}{4}$ of $\frac{2}{2}\frac{1}{9}$ to a single fraction.

Facit $\frac{3003}{4872}=\frac{1435}{2324}$.

28. Reduce $\frac{3}{4}$ of $\frac{5}{6}$ of $\frac{9}{10}$ to a single fraction.

Facit $\frac{135}{240}=\frac{9}{16}$.

29. Reduce $\frac{4}{5}$ of $\frac{5}{8}$ of $\frac{7}{9}$ to a single fraction.

Facit $\frac{168}{360}=\frac{7}{15}$.

30. Reduce $\frac{1}{7}$ of $\frac{5}{9}$ of $\frac{8}{10}$ to a single fraction.

Facit $\frac{80}{630}=\frac{8}{63}$.

6. *To reduce fractions of one denomination to the fraction of another*, but greater, *retaining the same value.*

RULE. Reduce the given fraction to a compound one, by comparing it with all the denominations between it, and that denomination which you would reduce it to; then reduce that compound fraction to a single one.

EXAMPLES.

31. Reduce $\frac{7}{8}$ of a penny to the fraction of a pound.

Facit $\frac{7}{8}$ of $\frac{1}{12}$ of $\frac{1}{20}=\frac{7}{1920}$.

32. Reduce $\frac{1}{4}$ of a penny to the fraction of a pound.

Facit $\frac{1}{960}$.

33. Reduce $\frac{4}{5}$ of a dwt. to the fraction of a lb. troy.

Facit $\frac{4}{1200}$.

34. Reduce $\frac{4}{7}$ of a lb. avoirdupoise to the fraction of an cwt.

Facit $\frac{4}{784}$.

7. *To reduce fractions of one denomination to the fraction of another*, but less, *retaining the same value.*

RULE. Multiply the numerator by the parts contained in the several denominations between it, and that you would reduce it to, for a new numerator, and place it over the given denominator.

Reduce the new fraction to its lowest terms.

EXAMPLES.

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EXAMPLES.

35. Reduce $\frac{7}{1920}$ of a pound to the fraction of a penny. *Facit* $\frac{1}{8}$.

$7 \times 20 \times 12 = 1680$ $\frac{168}{1920}$ *reduced to its lowest term* $= \frac{7}{8}$.

36. Reduce $\frac{1}{960}$ of a pound to the fraction of a penny. *Facit* $\frac{1}{4}$.

37. Reduce $\frac{4}{1200}$ of a pound troy to the fraction of a penny-weight. *Facit* $\frac{4}{5}$.

38. Reduce $\frac{4}{184}$ of an cwt. to the fraction of a lb. *Facit* $\frac{4}{7}$.

8. *To reduce fractions of one denomination to another of the same value, having the numerator given of the required fraction.*

RULE. As the numerator of the given fraction : is to its denominator : : so is the numerator of its intended fraction : to its denominator.

EXAMPLES.

39. Reduce $\frac{2}{3}$ to a fraction of the same value, whose numerator shall be 12. *As* 2 : 3 : : 12 : 18. *Facit* $\frac{12}{18}$.

40. Reduce $\frac{5}{7}$ to a fraction of the same value, whose numerator shall be 25. *Facit* $\frac{25}{35}$.

41. Reduce $\frac{5}{7}$ to a fraction of the same value, whose numerator shall be 47. *Facit* $\frac{47}{65\frac{4}{5}}$.

9. *To reduce fractions of one denomination to another of the same value, having the denominator given of the fraction required.*

RULE. As the denominator of the given fraction : is to its numerator : : so is the denominator of the intended fraction : to its numerator.

EXAMPLES.

42. Reduce $\frac{2}{4}$ to a fraction of the same value, whose denominator shall be 18. *As* 3 : 2 : : 18 : 12. *Facit* $\frac{12}{18}$.

43. Reduce $\frac{5}{7}$ to a fraction of the same value, whose denominator shall be 35. *Facit* $\frac{25}{35}$.

44. Reduce $\frac{5}{7}$ to a fraction of the same value, whose denominator shall be $65\frac{4}{5}$. *Facit* $\frac{47}{65\frac{4}{5}}$.

10. *To*

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10. *To reduce a mixed fraction to a single one.*

RULE. When the numerator is the integral part, multiply it by the denominator of the fractional part, adding in the numerator of the fractional part for a new numerator; then multiply the denominator of the fraction by the denominator of the fractional part for a new denominator.

EXAMPLES.

45. Reduce $\frac{36\frac{2}{3}}{48}$ to a simple fraction. *Facit* $\frac{110}{144}=\frac{55}{72}$.

$36\times3+2=110$ *numerator.*
$48\times3\ \ =144$ *denominator.*

46. Reduce $\frac{23\frac{5}{7}}{38}$ to a simple fraction. *Facit* $\frac{166}{266}=\frac{83}{133}$.

When the denominator is the integral part, multiply it by the denominator of the fractional part, adding in the numerator of the fractional part for a new denominator; then multiply the numerator of the fraction by the denominator of the fractional part for a new numerator.

EXAMPLES.

47. Reduce $\frac{47}{65\frac{4}{5}}$ to a simple fraction. *Facit* $\frac{235}{329}=\frac{5}{7}$.

48. Reduce $\frac{19}{41\frac{1}{3}}$ to a simple fraction. *Facit* $\frac{57}{123}=\frac{3}{7}$.

11. *To find the proper quantity of a fraction in the known parts of an integer.*

RULE. Multiply the numerator by the common parts of the integer, and divide by the denominator.

EXAMPLES.

49. Reduce $\frac{3}{4}$ of a pound sterling to its proper quantity.
$3\times20=60\div4=15$s. *Facit* 15s.

50. Reduce $\frac{2}{5}$ of a shilling to its proper quantity.
Facit 4*d*. 3 *qrs*. $\frac{1}{5}$.

51. Reduce $\frac{4}{7}$ of a lb. avoirdupoise to its proper quantity.
Facit 9 *oz*. 2 *dr*. $\frac{2}{7}$.

52. Reduce $\frac{7}{9}$ of an cwt. to its proper quantity.
Facit 3 *qrs*. 3 *lb*. 1 *oz*. 12 *dr*. $\frac{4}{9}$.

53. Reduce

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53. Reduce $\frac{3}{5}$ of a pound to troy its proper quantity.
Facit 7 oz. 4 dwt.

54. Reduce $\frac{3}{9}$ of an ell Engliſh to its proper quantity.
Facit 2 qrs. 3 nails $\frac{1}{9}$.

55. Reduce $\frac{4}{5}$ of a mile to its proper quantity.
Facit 6 furl. 16 poles.

56. Reduce $\frac{5}{8}$ of an acre to its proper quantity.
Facit 2 roods, 20 poles.

57. Reduce $\frac{6}{7}$ of an hogſhead of wine to its proper quantity.
Facit 54 gallons.

58. Reduce $\frac{3}{9}$ of a barrel of beer to its proper quantity.
Facit 12 gallons.

59. Reduce $\frac{5}{12}$ of a chaldron of coals to its proper quantity.
Facit 15 buſhels.

60. Reduce $\frac{3}{4}$ of a month to its proper time.
Facit 2 weeks, 2 days, 19 hours, 12 minutes.

12. *To reduce any given quantity to the fraction of any greater denomination, retaining the ſame value.*

RULE. Reduce the given quantity to the loweſt term mentioned for a numerator, under which ſet the integral part (reduce to the ſame term) for a denominator, and it will give the fraction required.

EXAMPLES.

61. Reduce 15*s.* to the fraction of a pound ſterling.
Facit $\frac{15}{20} = \frac{3}{4}$*ſ.*

62. Reduce 4*d.* 3 *qrs.* $\frac{1}{3}$ to the fraction of a ſhilling.
Facit $\frac{2}{3}$.

63. Reduce 9 oz. 2 dr. $\frac{2}{7}$ to the fraction of a lb. avoirdupoiſe.
Facit $\frac{4}{7}$.

64. Reduce 3 qrs. 3 lb. 1 oz. 12 dr. $\frac{4}{9}$ to the fraction of an cwt.
Facit $\frac{7}{9}$.

65. Reduce 7 oz. 4 dwts. to the fraction of a lb. troy.
Facit $\frac{3}{5}$.

66. Reduce 2 qrs. 3 nails, $\frac{1}{9}$ to the fraction of an Engliſh ell.
Facit $\frac{5}{9}$.

67. Reduce 6 furl. 16 poles to the fraction of a mile.
Facit $\frac{4}{5}$.

68. Reduce 2 roods 20 poles to the fraction of an acre.
Facit $\frac{5}{8}$.

69 Reduce 54 gallons to the fraction of a hogſhead of wine.
Facit $\frac{6}{7}$.

70. Reduce

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70. Reduce 12 gallons to the fraction of a barrel of beer. *Facit* $\frac{1}{3}$.

71. Reduce 15 bushels to the fraction of a chaldron of coals. *Facit* $\frac{5}{12}$.

72. Reduce 2 weeks, 2 days, 19 hours, 12 minutes, to the fraction of a month. *Facit* $\frac{3}{5}$.

ADDITION *of* VULGAR FRACTIONS.

RULE.

REDUCE the given fractions to a common denominator, then add all the numerators together, under which place the common denominator.

EXAMPLES.

1. Add $\frac{2}{3}$ and $\frac{5}{7}$ together. *Facit* $\frac{14}{21}+\frac{15}{21}=\frac{29}{21}=1\frac{8}{21}$
2. Add $\frac{1}{4}$, $\frac{2}{7}$ and $\frac{3}{6}$ together. *Facit* $1\frac{48}{168}$.
3. Add $\frac{1}{5}$, $4\frac{1}{3}$ and $\frac{2}{5}$ together. *Facit* $4\frac{70}{75}$.
4. Add $7\frac{2}{3}$, and $\frac{2}{5}$ together. *Facit* $8\frac{1}{15}$.
5. Add $\frac{2}{7}$, and $\frac{2}{3}$ of $\frac{1}{4}$ together. *Facit* $\frac{11}{14}$.
6. Add $5\frac{2}{3}$, $6\frac{7}{8}$, and $4\frac{1}{2}$ together. *Facit* $17\frac{1}{24}$.

2. When the fractions are of several denominations, reduce them to their proper quantities, and add as before.

7. Add $\frac{1}{4}$ of a pound to $\frac{5}{6}$ of a shilling. *Facit* 15*s.* 10*d.*
8. Add $\frac{1}{2}$ of a penny to $\frac{2}{3}$ of a pound. *Facit* 13*s.* $4\frac{1}{2}$*d.*
9. Add $\frac{1}{4}$ of a pound troy to $\frac{1}{6}$ of an ounce. *Facit* 9 *oz.* 3 *dwts.* 8 *gr.*
10. Add $\frac{4}{5}$ of a ton to $\frac{5}{6}$ of a lb. *Facit* 16 *cwt.* 0 *qr.* 0 *lb.* 13 *oz.* 5 *dr.* $\frac{1}{3}$.
11. Add $\frac{2}{3}$ of a chaldron to $\frac{1}{4}$ of a bushel. *Facit* 24 *bushels*, 3 *pecks.*
12. Add $\frac{1}{6}$ of a yard to $\frac{2}{3}$ of an inch. *Facit* 6 *inch.* 2 *bar.* 0.

SUBTRACTION *of* VULGAR FRACTIONS.

RULE.

REDUCE the given fractions to a common denominator, then subtract the less numerator from the greater, and place the remainder over the common denominator.

2. When

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2. When the lower fraction is greater than the upper, ſubtract the numerator of the lower fraction from the denominator, and to that difference add the upper numerator, carrying one to the unit's place of the lower whole number.

EXAMPLES.

1. From $\frac{1}{4}$ take $\frac{5}{7}$. $3\times7=21$. $5\times4=20$. $21-20=1$ *num.* $4\times7=28$ *den.* — — — *Facit* $\frac{1}{28}$.
2. From $\frac{5}{6}$ take $\frac{3}{8}$ of $\frac{5}{8}$ — — *Facit* $\frac{11}{24}$.
3. From $5\frac{2}{3}$ take $\frac{9}{10}$. — — *Facit* $4\frac{23}{30}$.
4. From $3\frac{8}{47}$ take $\frac{1}{5}$ — — — *Facit* $2\frac{9}{235}$.
5. From $\frac{12}{20}$ take $\frac{1}{7}$ of $\frac{2}{3}$. — — *Facit* $\frac{37}{42}$.
6. From $64\frac{1}{4}$ take $\frac{2}{3}$ of $\frac{3}{4}$. — — *Facit* $64\frac{1}{2}$.

3. When the fractions are of ſeveral denominaitons, reduce them to their proper quantities, and ſubtract as before.

7. From $\frac{1}{4}$ of a pound take $\frac{1}{5}$ of a ſhilling. *Facit* 14*s.* 3*d.*
8. From $\frac{2}{3}$ of a ſhilling take $\frac{1}{8}$ of a penny. *Facit* $7\frac{1}{2}$*d.*
9. From $\frac{1}{4}$ of a lb. troy take $\frac{1}{6}$ of an ounce.
Facit 8 *oz.* 16 *dwts.* 16 *grs.*
10. From $\frac{4}{5}$ of a ton take $\frac{5}{6}$ of a lb.
Facit 15 *cwt.* 3 *qrs.* 27 *lb.* 2 *oz.* 10 *dr.* $\frac{2}{3}$.
11. From $\frac{2}{3}$ of a chaldron take $\frac{3}{4}$ of a buſhel.
Facit 23 *buſhel* 1 *peck.*
12. From $\frac{1}{6}$ of a yard take $\frac{2}{3}$ of an inch. *Facit* 5 *in.* 1 *b. c.*

MULTIPLICATION *of* VULGAR FRACTIONS.

RULE.

PREPARE the given numbers (if they require it) by the rules of Reduction: then multiply the numerators together for a new numerator, and the denominators for a new denominator.

NOTE. *When any number, either whole or mixed, is multiplied by a fraction, the product will be always leſs than the multiplicand, in the ſame proportion as the multiplying fraction is leſs than an unit.*

EXAMPLES.

1. Multiply $\frac{3}{4}$ by $\frac{3}{5}$ *Fa.* $3\times3=9$ *num.* $4\times5=20$ *den.* $\frac{9}{20}$.
2. Multiply $\frac{7}{9}$ by $\frac{2}{3}$ — — — *Facit* $\frac{14}{27}$.
3. Multiply $48\frac{3}{5}$ by $13\frac{5}{6}$ — — *Facit* $672\frac{9}{30}$.

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4. Multiply 430 $\frac{6}{10}$ by 18 $\frac{4}{7}$. - *Facit* 7935 $\frac{24}{70}$.
5. Multiply $\frac{16}{21}$ by $\frac{1}{4}$ of $\frac{5}{7}$ of $\frac{4}{5}$. - *Facit* $\frac{9}{294}=\frac{1}{40}$.
6. Multiply $\frac{9}{10}$ by $\frac{2}{3}$ of $\frac{1}{4}$ of $\frac{5}{6}$. - *Facit* $\frac{3}{16}$.
7. Multiply $\frac{3}{4}$ of $\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{1}{3}$. - *Facit* $\frac{1}{3}$.
8. Multiply $\frac{1}{4}$ of $\frac{3}{8}$ by $\frac{5}{7}$. - *Facit* $\frac{15}{224}$.
9. Multiply 5 $\frac{6}{7}$ by $\frac{5}{6}$. - - *Facit* $4\frac{37}{42}$.
10. Multiply 24 by $\frac{2}{3}$. - - *Facit* 16.
11. Multiply $\frac{1}{4}$ of 9 by $\frac{7}{8}$. - - - *Facit* $5\frac{29}{32}$.
12. Multiply 9 $\frac{1}{2}$ by $\frac{2}{6}$. - - - *Facit* $3\frac{1}{6}$.

DIVISION *of* VULGAR FRACTIONS.

RULE.

PREPARE the given numbers (if they require it) by the rules of Reduction, then multiply the denominator of the divisor into the numerator of the dividend for a new numerator, and the numerator of the divisor into the denominator of the dividend for a new denominator.

Note. *When any whole number is divided by a fraction less than unity, the quotient will be greater than the dividend; but if any fraction be divided by a whole number greater than unity, the quotient will be less than the dividend.*

EXAMPLES.

1. Divide $\frac{9}{20}$ by $\frac{3}{5}$. $5\times9=45$ *num.* $3\times20=60$ *den.* $\frac{45}{60}=\frac{3}{4}$.
2. Divide $\frac{14}{27}$ by $\frac{2}{3}$. - *Facit* $\frac{7}{9}$.
3. Divide 672 $\frac{3}{30}$ by 13 $\frac{5}{6}$. - *Facit* 48 $\frac{3}{5}$.
4. Divide 7935 $\frac{24}{70}$ by 18 $\frac{4}{7}$ - *Facit* 430 $\frac{3}{5}$.
5. Divide $\frac{3}{8}$ by $\frac{2}{3}$ of $\frac{1}{4}$ of $\frac{9}{6}$. - *Facit* $\frac{9}{10}$.
6. Divde $\frac{2}{3}$ of 16 by $\frac{5}{7}$ of $\frac{3}{4}$. - *Facit* $19\frac{41}{45}$.
7. Divide $\frac{1}{8}$ of $\frac{2}{3}$ by $\frac{3}{4}$ of $\frac{1}{8}$. - *Facit* $\frac{24}{36}=\frac{2}{3}$.
8. Divde 9 $\frac{2}{12}$ by $\frac{1}{2}$ of 7. - *Facit* $2\frac{8}{21}$.
9. Divide $\frac{9}{16}$ by 4 $\frac{1}{2}$. - *Facit* $\frac{1}{8}$.
10. Divide 16 by 24 - *Facit* $\frac{2}{3}$.
11. Divide 5205 $\frac{2}{10}$ by $\frac{4}{3}$ of 91. - *Facit* $71\frac{1}{2}$.
12. Divide 3 $\frac{1}{6}$ by 9 $\frac{1}{2}$. - *Facit* $\frac{1}{3}$

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The SINGLE RULE *of* THREE DIRECT, *in* VULGAR FRACTIONS.

RULE.

REDUCE the numbers as before directed in Reduction, ſo that the third and firſt may be of the ſame name: multiply the numerator of the firſt fraction by the denominator of the ſecond and third, for a new denominator; then multiply the denominator of the firſt fraction by the numerator of the ſecond and third for a new numerator; that fraction will be the anſwer to the queſtion, which reduce to its proper quantity. Or, when the three terms are properly reduced, proceed as in the Rule of Three of whole numbers.

EXAMPLES.

1. If $\frac{4}{5}$ of a yard coſt $\frac{5}{8}$ of a £. what will $\frac{9}{10}$ of a yard come to at that rate? *Anſ.* $\frac{18}{24}=15s.$

$\frac{4}{5}$ *yd.* : $\frac{5}{8}$ £.– : : $\frac{9}{10}$ *yd.* : $\frac{45}{24}$ £.

for $4\times5\times9=180$ *num.* *or* $\frac{5}{8}\times\frac{9}{10}=\frac{45}{80}\div\frac{1}{4})\frac{45}{80}(\frac{18}{24}|\frac{0}{6}$
and $3\times8\times10=240$ *den.*

2. If $\frac{5}{6}$ of a yard coſt $\frac{2}{3}$ £. what will $\frac{1}{12}$ of a yard coſt? *Anſ.* 14*s.* 8*d.*

3. If $\frac{1}{4}$ of a yard of lawn coſt 7*s.* 3*d.* what will 10 yards $\frac{1}{3}$ coſt? *Anſ.* £4..19..10$\frac{1}{2}\frac{2}{3}$.

4. If $\frac{7}{8}$ lb. coſt $\frac{1}{4}$*s.* how many pounds will $\frac{8}{9}$ of 1*s.* buy? *Anſ.* 1 *lb.* $\frac{8}{28}$.

5. If $\frac{3}{5}$ ell of Holland coſt $\frac{1}{3}$ £. what will 12 ells $\frac{2}{3}$ coſt at that rate? *Anſ.* £.7..–..8$\frac{3}{4}\frac{15}{27}$.

6. If 12 $\frac{1}{2}$ yards of cloth coſt 25*s.* 9*d.* what will 48 $\frac{1}{4}$ coſt at the ſame rate? *Anſ.* £3..9..–$\frac{1}{100}$.

7. If $\frac{9}{10}$ of an cwt. coſt 284*s.* what will 7 cwt. $\frac{1}{2}$ coſt at the ſame rate? *Anſ.* £118..6..8.

8. If 3 yards of broad cloth coſt £2. $\frac{4}{5}$. what will 10 yards $\frac{2}{7}$ coſt? *Anſ.* £9..12..–.

9. If $\frac{1}{4}$ of a yard coſt $\frac{2}{3}$ of a £. what will $\frac{1}{2}$ of an ell Engliſh come to at the ſame rate? *Anſ.* £2.

10. If 1 lb. of cochineal coſt £1..5..–. what will 36 lb. $\frac{7}{10}$ come to? *Anſ.* £45..17..6.

11. If 1 yard of broad cloth coſt 25*s.* $\frac{5}{8}$. what will 4 pieces coſt, each containing 27 yards $\frac{3}{4}$.? *Anſ.* £84..14..3$\frac{4}{6}$.

12. Bought 3 pieces $\frac{3}{4}$ of ſilk, each containing 24 ells $\frac{3}{8}$, at 6*s.*–.. $\frac{3}{4}$ per ell, I deſire to know what the whole quantity coſt? *Anſ.* £25..17..2$\frac{1}{16}$.

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The SINGLE RULE *of* THREE INVERSE, *in* VULGAR FRACTIONS.

EXAMPLES.

IF 48 men can build a wall in 24 days $\frac{1}{2}$, how many men can do the same in 192 days? *Anſ.* 6 *men* $\frac{4}{768}$.

2. If 25*s.* $\frac{2}{7}$ will pay for the carriage of cwt. 145 miles $\frac{1}{4}$, how far may 6 cwt. $\frac{1}{2}$ be carried for the ſame money?
Anſ. 22 *miles* $\frac{9}{20}$.

3. If $3\frac{1}{4}$ yards of cloth, that is $1\frac{1}{3}$ yard wide, be ſufficient to make a cloak, how much muſt I have of that ſort which is $\frac{4}{5}$ yard wide, to make another of the ſame bigneſs?
Anſ. 4 $\frac{7}{8}$ *yards.*

4. If three men can do a piece of work in 4 hours $\frac{1}{2}$, in how many hours will 10 men do the ſame work?
Anſ. 1 *hour* $\frac{7}{20}$.

5. If a penny white loaf weigh 7 oz. when a buſhel of wheat coſt 5*s.* 6*d.* what is the buſhel worth when the penny white loaf weighs but 2 oz. $\frac{1}{2}$? *Anſ.* 15*s.* 4*d.* $\frac{4}{5}$.

6. What quantity of ſhalloon that is $\frac{3}{4}$ yard wide will line $7\frac{1}{2}$ yards of cloth that is $1\frac{1}{2}$ yard wide? *Anſ.* 15 *yards.*

DOUBLE RULE *of* THREE, *in* VULGAR FRACTIONS.

EXAMPLES.

IF a carrier receives £2. $\frac{1}{10}$. for the carriage of 3 cwt. 150 miles, how much ought he to receive for the carriage of 7 cwt. 3 qrs. $\frac{1}{2}$ 50 miles? *Anſ.* £1..16..9.

2. If £100. in 12 months gain £6. intereſt, what principal will gain £3. $\frac{3}{8}$. in 9 months? *Anſ.* £75.

3. If 9 ſtudents ſpend £10. $\frac{7}{9}$ in 18 days, how much will 20 ſtudents ſpend in 30 days? *Anſ.* £39..18..4. $\frac{360}{1458}$.

4. A man and his wife having laboured one day, earned 4*s.* $\frac{5}{8}$, how much muſt they have for 10 days $\frac{1}{2}$, when their two ſons helped them? *Anſ.* £4..17..1. $\frac{1}{2}$.

5. If £50 in 5 months gain £2. $\frac{37}{1441}$, what time will £13. $\frac{1}{3}$ require to gain £1. $\frac{1}{12}$? *Anſ.* 9 *months.*

6. If the carriage of 60 cwt. 20 miles coſt £14. $\frac{1}{2}$, what weight can I have carried 30 miles for £5. $\frac{7}{16}$.?
Anſ. 15 *cwt.*

THE

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PART III.

DECIMAL FRACTIONS.

IN Decimal Fractions the integer or whole thing, as one pound, one yard, one gallon, &c. is ſuppoſed to be divided into ten equal parts, and thoſe parts into tenths, and ſo on without end.

So that the denominator of a decimal being always known to conſiſt of an unit with as many cyphers as the numerator has places, therefore is never ſet down; the parts being only diſtinguiſhed from the whole numbers by a comma prefixed; thus, ,5 which ſtands for $\frac{5}{10}$, ,25 for $\frac{25}{100}$, ,123 for $\frac{123}{1000}$.

But the different value of figures appear plainer by the following table.

Whole numbers.							Decimal parts.						
7	6	5	4	3	2	1	2	3	4	5	6	7
Millions.	*C Thouſands.*	*X Thouſands.*	*Thouſands.*	*Hundreds.*	*Tens.*	*Units.*	*Parts of Tens.*	*Parts of Hundreds.*	*Parts of Thouſands.*	*Parts of X Thouſands.*	*Parts of C Thouſands.*	*Parts of Millions.*

From which it plainly appears, that, as whole numbers increaſe in a ten-fold proportion to the left-hand, decimal parts decreaſe in a ten-fold proportion to the right-hand:

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so that cyphers placed before decimal parts decreaſe their value, by removing them farther from the comma, or units place; thus, ,5 is 5 parts of 10, or $\frac{5}{10}$; ,05 is 5 parts of 100, or $\frac{5}{100}$; ,005 is 5 parts of 1000, or $\frac{5}{1000}$; ,0005 is 5 parts of 10000, or $\frac{5}{10000}$. But cyphers after decimal parts do not alter their value. For ,5 ,50, ,500, &c. are each but $\frac{5}{10}$ of the unit.

A FINITE DECIMAL is that which ends at a certain number of places; but an INFINITE is that which no where ends.

A RECURRING DECIMAL is that wherein one or more figures are continually repeated, as 2,75222.

And 52,275275275 is called a COMPOUND RECURRING DECIMAL.

Note. *A finite decimal may be conſidered as infinite, by making cyphers to recur; for they do not alter the value of the decimal.*

In all operations, if the reſult conſiſts of ſeveral nines, reject them, and make the next ſuperior place an unit more; thus for 26,25999 write 26,26.

In all circulating numbers, daſh the firſt figure that begins to circulate thus, as in 86,54$\dot{6}$6$\dot{6}$.

ADDITION *of* DECIMALS.

RULE.

IN ſetting down the propoſed numbers to be added, great care muſt be taken in placing every figure directly underneath thoſe of the ſame value, whether they be mixed numbers, or pure decimal parts; and to perform which there muſt be a due regard had to the commas or ſeparating points, which ought always to ſtand in a direct line, one under another, and to the right-hand of them carefully place the decimal parts, according to their reſpective values; then add them as in whole numbers.

EXAMPLES.

1. Add 72,5+32,071+2,1574+371,4+2,75.
   Facit 480,8784.
2. Add 30,07+2,007+59,4+3207,1.
3. Add 3,5+47,25+927,01+2,0073+1,5.
4. Add 52,75+47,21+724+31,4525+,3075.
5. Add 3275+27,514+1,005+725+7,32.
6. Add 27,5+52+3,2075+,5741+2720.

SUB-

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SUBTRACTION *of* DECIMALS.

RULE.

SUBTRACTION of Decimals differs but little from whole numbers, only in placing the numbers, which muſt be carefully obſerved, as in addition.

EXAMPLES.

1. From ,2754 take ,2371	5. From 57 take 54,72
2. From 2,37 take 1,76	6. From 625 take 76,91
3. From 272 take 215,7	7. From 23,415 take ,3742
4. From 270,2 take 75,4075	8. From ,107 take ,0007

MULTIPLICATION *of* DECIMALS.

RULE.

PLACE the factors, and multiply them, as in whole numbers, and from the product towards the right-hand cut off as many places for decimals as there are in both factors together; but if there ſhould not be ſo many places in the product, ſupply the defect with cyphers to the left-hand.

EXAMPLES.

1. Multiply ,2365 by ,2335. *Facit* ,05522275.

2. Multiply 2,071 by 2,27	7. Multiply 27,35 by 7,70071
3. Multiply 27,15 by 25,3	8. Multiply 57,21 by ,0075
4. Multiply 72347 by 23,15	9. Multiply ,007 by ,007
5. Multiply 17105 by ,3257	10. Multiply 20,15 by ,270,5
6. Multiply 17105 by ,0237	11. Multiply ,907 by ,0025

When any number of decimals is to be multiplied by 10, 100, 1000, &c. it is only removing the ſeparating point in the multiplicand ſo many places towards the right-hand as there are cyphers in the multiplier: thus, ,578 × 10 = 5,78. ,578 × 100 = 57,8. ,578 × 1000 = 578. 578 × 1000 = 5780.

Contracted

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Contracted MULTIPLICATION *of* DECIMALS.

RULE.

PUT the unit's place of the multiplier under that place of the multiplicand that is intended to be kept in the product; then invert the order of all the other figures, *i. e.* write them all the contrary way; then in multiplying, begin at the figure in the multiplicand, which ſtands over the figure you are then multiplying with, and ſet down the firſt figure of each particular product directly one under the other, and have a due regard to the increaſe ariſing from the figures on the right-hand of that figure you begin to multiply at in the multiplicand.

Note, *That in multiplying the figure left out every time next the right-hand in the multiplicand, if the product be 5, or upwards, to 15, carry 1; if 15, or upwards, to 25, carry 2; and if 25, or upwards, to 35, carry 3,* &c.

EXAMPLES.

12. Multiply 384,672158 by 36,8345, and let there be only four places of decimals in the product.

Facit 14169,2065.

Contracted Way.	*Common Way.*
384,672158	384,672158
5438,63	36,8345
115401647	1923360790
23080329	15386 38632
3077377	115401 6474
115402	3077377 264
15387	23080329 48
1923	115401647 4
14169,2065	14169,2066 038510

13. Multiply 3,141592 by 52,7438, and leave only 4 places of decimals. *Facit* 165,6994.

14. Multiply 2,38645 by 8,2175, and leave only 4 places of decimals. *Facit* 19,6107.

15. Multiply 375,13758 by 16,7324, and let there be only 1 place of decimals. *Facit* 6276,9.

16. Multiply 375,13758 by 16,7324, and leave only 4 places of decimals. *Facit* 6276,9520.

17. Multiply 395,3756 by ,75642, and let there be only 4 places of decimals. *Facit* 299,0699.

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DIVISION *of* DECIMALS.

THIS Rule is alſo worked as in whole numbers: the only difficulty is in valuing the quotient, which is done by any of the following Rules:

RULE 1. The firſt figure in the quotient is always of the ſame value with that figure of the dividend, which anſwers or ſtands over the place of units in the diviſor.

2. The quotient muſt have always ſo many decimal places, as the dividend has more than the diviſor.

Note 1. *If the diviſor and dividend have both the ſame number of decimal parts, the quotient will be a whole number.*

2. *If the dividend hath not ſo many places of decimals as are in the diviſor, then ſo many cyphers muſt be annexed to the dividend as will make them equal, and the quotient will then be a whole number.*

3. *But if, when the diviſion is done, the quotient has not ſo many figures as it ſhould have places of decimals, then ſo many cyphers muſt be prefixed as there are places wanting.*

EXAMPLES.

1. Divide 85643,825 by 6,321. *Facit* 13549.

2. Divide 48 by 144.	7. Divide 7382,54 by 6,4252.
3. Divide 217,75 by 65.	8. Divide ,0851648 by 423.
4. Divide 125 by ,045.	9. Divide 267,15975 by 13,25.
5. Divide 709 by 2,574.	10. Divide 72,1564 by 1347.
6. Divide 5,7714 by 8275.	11. Divide 715 by ,3075.

When numbers are to be divided by 10, 100, 1000, 10000, &c. it is performed by placing the ſeparating point in the dividend, ſo many places towards the left hand, as there are cyphers in the diviſor.

Thus, 5784÷ 10=578,4 5784÷ 1000=5,784.
5784÷ 100=57,84 5784÷ 10000=,5784.

Contracted

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Contracted DIVISION *of* DECIMALS.

RULE.

BY the first rule find what is the value of the first figure in the quotient; then by knowing the first figure's denomination, the decimal places may be reduced to any number, by taking as many of the left-hand figures of the dividend as will answer them; and in dividing omit one figure of the divisor at each following operation.

Note, *That in multiplying every figure left out in the divisor, you must carry* 1; *if it be* 5, *or upwards, to* 15; *if* 15 *or upwards, to* 25, *carry* 2; *if* 25, *or upwards, to* 35, *carry* 3, &c.

EXAMPLES.

12. Divide 721,17562 by 2,257432, and let there be only three places of decimals in the quotient.

Contracted.		*Common way.*	
2,257432)	721,17562 (319.467	2,257432)	721,17562 (319.67
.....	6772296		6772296
	439460 .		4394602
	225743 .		2257432
	213717		2137100
	203169		2031688
	10548 . . .		105481200
	9030. . .		90297280
	1518		15183920
	1354		13544592
	164		1639328
	158		1580202
	6		591256

13. Divide 8,758615 by 5,2714167.
14. Divide 51717591 by 8,7586.
15. Divide 25,1367 by 217,35.
16. Divide 51,47549 by .123415.
17. Divide 70,23 by 7, 9863.
18. Divide 27,184 by 3,712.

REDUCTION

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REDUCTION *of* DECIMALS.

To reduce a Vulgar Fraction to a Decimal.

RULE.

ADD cyphers to the numerator, and divide by the denominator, the quotient is the decimal fraction required.

EXAMPLES.

1. Reduce $\frac{1}{4}$ - - - - to a decimal. 4)1,00(,25 *Facit.*
2. Reduce $\frac{1}{2}$ - - - - to a decimal. *Facit* ,5.
3. Reduce $\frac{3}{4}$ - - - - to a decimal. *Facit* ,75.
4. Reduce $\frac{3}{8}$ - - - - to a decimal. *Facit* ,375.
5. Reduce $\frac{5}{26}$ - - - to a decimal. *Facit* ,1923076+.
6. Reduce $\frac{11}{18}$ of $\frac{10}{18}$ to a decimal. *Facit* ,6043956+.

Note, *If the given parts are of several denominations, they may be reduced either by so many distinct operations, as there are different parts, or by first reducing them into their lowest denomination, and then divide as before; or,*

2dly, *Bring the lowest into decimals of the next superior denomination, and on the left hand of the decimal found, place the parts given of the next superior denomination: so proceeding till you bring out the decimal parts of the highest integer required, by still dividing the product by the next superior denominator; or,*

3dly, *To reduce shillings, pence, and farthings. If the number of shillings be even, take half for the first place of decimals, and let the second and third places be filled up with the farthings contained in the remaining pence and farthings, always remembering to add* 1, *when it is or exceeds* 25. *But if the number of shillings be odd, the second place of decimals must be increased by* 5.

7. Reduce 5*s.* to the decimal of a £. *Facit* ,25.
8. Reduce 9*s.* to the decimal of a £. *Facit* ,45.
9. Reduce 16*s.* to the decimal of a £. *Facit* ,8.

10. Reduce

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10. Reduce 8*s.* 4*d.* to the decimal of a £. *Facit* ,4166.

11. Reduce 16*s.* 7¼*d.* to the decimal of a £.

Facit ,8322916.

first.	*second.*	*third.*	
16*s.* 7¼*d.*	4)3,00	2)16	7¼
12			4
199	12)7,75	,832	32
4	20)16,64583		
960)799(,8322916	,8322916		

12. Reduce 19*s.* 5½*d.* to the decimal of a £.

Facit ,972916.

13. Reduce 12 grains to the decimal of a lb. troy.

Facit ,002083.

14. Reduce 12 drams to the decimal of a lb. avoirdupoise.

Facit ,046875.

15. Reduce 2 qrs. 14 lb. to the decimal of an cwt.

Facit ,625.

16. Reduce two furlongs to the decimal of a league.

Facit ,0833.

17. Reduce 2 quarts, 1 pint, to the decimal of a gallon.

Facit ,625.

18. Reduce 4 gallons, 2 quarts of wine, to the decimal of an hogshead. *Facit* ,071428+.

19. Reduce 2 gallons, 1 quart of beer, to the decimal of a barrel. *Facit* ,0625.

20. Reduce 52 days to the decimal of a year.

Facit ,142465+.

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To find the value of any Decimal Fraction, *in the known parts of an* Integer.

RULE. Multiply the decimal given, by the number of parts of the next inferior denomination, cutting off the decimals from the product; then multiply the remainder by the next inferior denomination; thus proceeding, till you have brought in the leaſt known parts of the integer.

EXAMPLES.

21. What is the value of ,8322916 of £. *Anſ.* 16*s.* 7½*d*+.

20

16,6458320

12

7,7499840

4

½,9999360

22. What is the value of ,002084 of a lb. troy?
Anſ. 12,00384 *qrs.*
23. What is the value of ,046875 of a lb. Avoirdupoiſe?
Anſ. 12 *drams.*
24. What is the value of ,625 of an cwt.?
Anſ. 2 *qrs.* 14 *lb.*
25. What is the value of ,625 of a gallon?
Anſ. 2 *quarts*, 1 *pint.*
26 What is the valuc of ,071428 of a hogſhead of wine?
4 *gallons* 1 *quart*, ,999856.
27. What is the value of ,0625 of a barrel of beer?
Anſ. 2 *gallons* 1 *quart.*
28. What is the value of ,142465 of a year?
Anſ. 51,999725 *days.*

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Decimal Tables of Coin, Weight, and Measure.

TABLE I.

English Coin.

1£. the Integer.

Sh.	dec.	Sh.	dec.
19	,95	9	,45
18	,9	8	,4
17	,85	7	,35
16	,8	6	,3
15	,75	5	,25
14	,7	4	,2
13	,65	3	,15
12	,6	2	,1
11	,55	1	,05
10	,5		

Pence	Decimals.
6	,025
5	,020833
4	,016666
3	,0125
2	,00833
1	,00416

Farth.	Decimals.
3	,003125
2	,0020833
1	,0010416

TABLE II.

Eng. Coin. 1 *Sh.*

Long Meas. 1 *Foot* the Integer.

Pence & Inches.	Decimals.
6	,5
5	,416666
4	,333333
3	,25
2	,166666
1	,083333

Farthings.	Decimals.
3	,0625
2	,041666
1	,020833

TABLE III.

Troy Weight.

1lb. the Integer.

Ounces the same as Pence in the last Table.

Penny weight.	Decimals.
10	,041666
9	,0375
8	,033333
7	,029166
6	,025
5	,020833
4	,016666
3	,0125
2	,008333
1	,004166

Grains	Decimals.
12	,002083
11	,001910
10	,001736
9	,001562
8	,001389
7	,001215
6	,001042
5	,000868
4	,000694
3	,000521
2	,000347
1	,000173

1 Oz. the Integer.

Penny-weights the same as Shillings in the 1st. Table.

Grains.	Decimals.
12	,025
11	,022916
10	,020833
9	,01875
8	,016666
7	,014583
6	,0125
5	,010416
4	,008333
3	,00625
2	,004166
1	,002083

TABLE IV.

Avoirdup. Wt.

112lb. the Integ.

Qrs.	Decimals.
1	,75
2	,5
3	,25

Pounds	Decimals.
14	,125
13	,116071
12	,107143
11	,098214
10	,089286
9	,080357
8	,071428
7	,0625
6	,053571
5	,044643
4	,035714
3	,026786
2	,017857
1	,008928

Ounces	Decimals.
8	,004464
7	,003906

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Decimal Tables of Coin, Weight, and Measure.

·6	,003348
5	,002790
4	,002232
3	,001674
2	,001116
1	,000558

¼ Oz.	Decimals.
3	,000418
2	,000279
1	,000139

TABLE V.

Avoir. Weight.

1 lb. the Integer.

Ounces.	Decimals.
8	,5
7	,4375
6	,375
5	,3125
4	,25
3	,1875
2	,125
1	,0625

Drams.	Decimals.
8	,03125
7	,027343
6	,023437
5	,019531
4	,015625
3	,011718
2	,007812
1	,003906

TABLE VI.

Liquid Measure

1 Tun the Integer.

Gallons.	Decimals.
100	,396825
90	,357141
80	,317460
70	,27
60	,238095
50	,198412
40	,158730
30	,119047
20	,079365
10	,039682
9	,035714
8	,031746
7	,027
6	,023809
5	,019841
4	,015873
3	,011904
2	,007936
1	,003968

Pints.	Decimals.
4	,001984
3	,001488
2	,000992
1	,000496

A Hogshead the Integer.

Gallons.	Decimals.
30	,476190
20	,317460
10	,158730
9	,142857
8	,126984
7	,111111
6	,095238
5	,079365
4	,063492
3	,047619
2	,031746
1	,015873

Pints.	Decimals.
3	,005952
2	,003968
1	,001984

TABLE VII.

Measure.

Liquid. *Dry.*

1 *Gallon.* 1 *Quarter.*

Integer.

Pints	Decim.	Bush.
4	,5	4
3	,375	3
2	,25	2
1	,125	1

Q. p.	Decim.	Peck.
3	,09375	3
2	,0625	2
1	,03125	1

Decimals.	Q. Pk.
,0234375	3
,015625	2
,0078125	1

Decimals.	Pints.
,005859	3
,003906	2
,001953	1

TABLE VIII.

Long Measure.

1 Mile the Integer.

Yards.	Decimals.
1000	,568182
900	,511364
800	,454545
700	,397727
600	,340909

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500	,284091
400	,227272
300	,170454
200	,113636
100	,056818
90	,051136
80	,045454
70	,039773
60	,034091
50	,028409
40	,022727
30	,017045
20	,011364
10	,005682
9	,005114
8	,004745
7	,003977
6	,003409
5	,002841
4	,002273
3	,001704
2	,001136
1	,000568

Feet.	*Decimals.*
2	,0003787
1	,0001894

Inch.	*Decimals.*
6	,0000947
3	,0000474
1	,00001 58

TABLE IX.

TIME.

1 Year the Integer.

Months the same as Pence in the second Table.

Days.	*Decimals.*
365	1,000000
300	,821918
200	,547945
100	,273973
90	,246575
80	,219178
70	,191781
60	,164383
50	,136986
40	,109589
30	,082192
20	,054794
10	,027397
9	,024657
8	,021918
7	,019178
6	,016438
5	,013698
4	,010959
3	,008219
2	,005479
1	,002732

1 Day the Integer.

Hours.	*Decimals.*
12	,5
11	,458333
10	,416666
9	,375
8	,333333
7	,291666
6	,25
5	,208333
4	,166666
3	,125
2	,083333
1	,041666

Minutes.	*Decimals.*
30	,020833
20	,013888
10	,006944
9	,00625
8	,005555
7	,004861
6	,004166
5	,003472
4	,002777
3	,002083
2	,001388
1	,000694

TABLE X.

CLOTH MEASURE.

1 Yard the Integer.

Qrs. the same as Table 4.

Nails.	*Decimals.*
2	,125
1	,0625

TABLE XI.

LEAD WEIGHT.

1 Foth. the Integ.

Hund.	*Decimals.*
10	,512820
9	,461538
8	,410256
7	,358974
6	,307692
5	,256410
4	,205128
3	,153846
2	,102564
1	,051282

Qrs.	*Decimals.*
2	,025641
1	,012820

Pound	*Decimals.*
14	,0064102
13	,0059523
12	,0054945
11	,0050366
10	,0045787
9	,0041208
8	,0036630
7	,0032051
6	,0027472
5	,0022893
4	,0018315
3	,0013736
2	,0009157
1	,0004578

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The RULE *of* THREE *in* DECIMALS.

EXAMPLES.

IF 26 ½ yards coſt £3..16..3. what will 32 ¼ yards come to? *Anſ.* £4..12..9½.

Yds. £. *Yds*
26,5 : 3,8125 : : 32,25 :
32,25

26,5)122,953125(4,63974=£4..12. 9½.

2. What will the pay of 540 men come to at £1..5..6. *per* man? *Anſ.* £688..10..–.

3. If 7 ¼ yards of cloth coſt £2..12..9. what will 140 ½ yards of the ſame coſt? *Anſ.* £47..16..3..2,4 *qrs.*

4. If a cheſt of ſugar, weighing 7 cwt. 2 qrs. 14 lb. coſt £36..12..9. what will 2 cwt. 1 qr. 21 lb. of the ſame coſt? *Anſ.* £11..14..2..3,5 *qrs.*

5. A grocer buys 24 ton, 12 cwt. 2 qrs. 14lb. 12 oz. of tobacco for £3678..6..4. what will 1 oz. come to? *Anſ.* 1*d.*

6. What will 326 lb. 1 qr. of tobacco come to, when 1½lb. is ſold for 3*s.* 6*d.*? *Anſ.* £38..1..3.

7. What is the worth of 19 oz. 3 dwt. 5 gr. of gold, at £2..19..– *per* oz.? *Anſ.* £56..10..5..2,99 *qrs.*

8. What is the worth of 827 ¼ yards of painting, at 10½*d.* per yard? *Anſ.* £36..4..3..1,5 *qrs.*

9. If I lent my friend £34. for ⅝ of a year, how much ought he to lend me $\frac{5}{12}$ of a year to requite my kindneſs? *Anſ.* £51.

10. If ¾ of a yard of cloth, that is 2 yards ¼ broad, make a garment, how much that is ⅘ of a yard wide will make the ſame? *Anſ.* 2,109375 *yards.*

11. If one ounce of ſilver coſt 5*s.* 6*d.* what is the price of a tankard that weighs 1 lb. 10 oz. 10 dwt. 4 gr.? *Anſ.* £6..3..9..2,2 *qrs.*

12. If 1 lb. of tobacco coſt 15*d.* what coſt 3 hogſheads, weighing together 15 cwt. 1 qr. 19 lb.? *Anſ.* £107..18..9.

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13. If 1 cwt. of currants coſt £2..9..6. what will 45 cwt. 3 qrs. 14 lb. coſt at the ſame rate? *Anſ.* £113..10..9..3 *qrs.*

14. Bought 6 cheſts of ſugar, each 6 cwt. 3 qrs. at £2..16..–. *per* cwt. what do they come to? *Anſ.* £113..8..–.

15. Bought a tankard for £10..12..–. at the rate of 5*s.* 4*d.* *per* ounce, what was the weight? *Anſ.* 39 *oz.* 15 *dwt.*

16. Gave £187..3..3. for 25 cwt. 3 qrs. 14 lb. of tobacco, at what rate did I buy it at *per* lb.? *Anſ.* 15*d.* 2 *qrs.*

17. Bought 29 lb. 4 oz. of coffee for £10..11..3. what is the value of 3 lb.? *Anſ.* £1..1..8.

18. If I gave 1*s.* 1*d.* for 3 lb. ½ of cheeſe, what will be the value of 1 cwt.? *Anſ.* £1..14..8.

EXTRACTION *of the* SQUARE ROOT.

EXTRACTING the Square Root is to find out ſuch a number as being multiplied into itſelf, the product will be equal to the given number.

RULE. *Firſt*, Point the given number, beginning at the unit's place, then to the hundreds, and ſo upon every ſecond figure throughout.

Secondly, Seek the greateſt ſquare number in the firſt point towards the left-hand, placing the ſquare number under the firſt point, and the root thereof in the quotient; ſubtract the ſquare number from the firſt point, and to the remainder bring down the next point, and call that the reſolvend.

Thirdly, Double the quotient, and place it for a diviſor on the left-hand of the reſolvend; ſeek how often the diviſor is contained in the reſolvend (preſerving always the unit's place,) and put the anſwer in the quotient, and alſo on the right-hand ſide of the diviſor; then multiply by the figure laſt put in the quotient, and ſubtract the product from the reſolvend; bring down the next point to the remainder, (if there be any more) and proceed as before.

ROOTS,	1.	2.	3.	4.	5.	6.	7.	8.	9.
SQUARES,	1.	4.	9.	16.	25.	36.	49.	64.	81.

EXAMPLES.

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EXAMPLES.

1. What is the ſquare root of 119025? *Anſ.* 345.

```
119025(345
 9
-----
64)290
   256
-------
685)3425
    3425
```

2. What is the ſquare root of 106929? *Anſ.* 327.
3. What is the ſquare root of 2268741? *Anſ.* 1506,23+.
4. What is the ſquare root of 7596796? *Anſ.* 2756,228+.
5. What is the ſquare root of 36372961? *Anſ.* 6031.
6. What is the ſquare root of 22071204? *Anſ.* 4698.

When the given number conſiſts of a whole number, and decimals together, make the number of decimals even, by adding cyphers to them; ſo that there may be a point fall on the unit's place of the whole number.

7. What is the ſquare root of 3271,4207? *Anſ.* 57,19+.
8. What is the ſquare root of 4795,25731? *Anſ.* 69,247+.
9. What is the ſquare root of 4,372594? *Anſ.* 2,091+.
10. What is the ſquare root of 2,2710957? *Anſ.* 1,50701+.
11. What is the ſquare root of ,00032754? *Anſ.* ,01809+.
12. What is the ſquare root of 1,270054? *Anſ.* 1,1269+.

To extract the Square Root *of a* VULGAR FRACTION.

RULE. Reduce the fraction to its loweſt terms: then extract the ſquare root of the numerator for a new numerator, and the ſquare root of the denominator for a new denominator.

If the fraction be a ſurd, (i. e.) *a number where a root can never be exactly found, reduce it to a decimal, and extract the root from it.*

EXAMPLES.

13. What is the ſquare root of $\frac{2304}{5184}$? *Anſ.* $\frac{2}{3}$.
14. What is the ſquare root of $\frac{2704}{4225}$? *Anſ.* $\frac{4}{5}$.
15. What is the ſquare root of $\frac{9216}{12544}$? *Anſ.* $\frac{6}{7}$

SURDS.

SURDS.

16. What is the square root of $27\frac{5}{41}$? *Anſ.* ,89802+.
17. What is the square root of $3\frac{7}{76}$? *Anſ.* ,86602+.
18. What is the square root of $47\frac{8}{49}$? *Anſ.* ,93308+.

To extract the Square Root *of a* MIXED NUMBER.

RULE 1. Reduce the fractional part of the mixed number to its loweſt term, and then the mixed number to an improper fraction.

2. Extract the roots of the numerator and denominator for a new numerator and denominator.

If the mixed number given be a ſurd, reduce the fractional part to a decimal, annex it to the whole number, and extract the ſquare root therefrom.

EXAMPLES.

19. What is the square root of $51\frac{21}{25}$? *Anſ.* $7\frac{1}{5}$.
20. What is the square root of $27\frac{9}{16}$? *Anſ.* $5\frac{1}{4}$.
21. What is the square root of $9\frac{43}{49}$? *Anſ.* $3\frac{1}{7}$?

SURDS.

22. What is the square root of $85\frac{14}{15}$? *Anſ.* 9,27 +.
23. What is the square root of $8\frac{5}{7}$? *Anſ.* 2,9519+.
24. What is the square root of $6\frac{2}{3}$? *Anſ.* 2,5819+.

APPLICATION.

25. There is an army conſiſting of a certain number of men, who are placed rank and file (that is, in the form of a ſquare, each ſide having 576 men) I deſire to know how many the whole ſquare contains? *Anſ.* 331776.

26. A certain pavement is made exactly ſquare, each ſide of which contains 97 feet. I demand how many ſquare feet are contained therein? *Anſ.* 9409.

To find a mean proportional between any two given numbers.

RULE. The ſquare root of the product of the given numbers is the mean proportional ſought.

EXAMPLES.

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EXAMPLES.

27. What is the mean proportional between 3 and 12?
Anſ. $3 \times 12 = 36$ *then* $\sqrt{36} = 6$ *the mean proportional.*

28. What is the mean proportional between 4276 and 842? *Anſ.* 1897,4+.

To find the ſide of a ſquare equal in area to any given ſuperfices.

RULE. The ſquare root of the content of any given ſuperfices, is equal to the ſide of the ſquare ſought.

EXAMPLES.

29. If the content of a given circle be 160, what is the ſide of the ſquare? *Anſ.* 12,64911.

30. If the area of a circle is 750, what is the ſide of the ſquare equal? *Anſ.* 27,38612.

The area of a circle given, to find the diameter.

RULE. As 355 : 452, or, as 1 : 1,273239 : : ſo is the area : to the ſquare of the diameter : —or, multiply the ſquare root of the area, by 1,12837, and the product will be the diameter.

EXAMPLES.

31. What length of cord will be fit to tie to a cow's tail, the other end fixed in the ground, to let her have liberty of eating an acre of graſs, and no more, ſuppoſing the cow and tail to be $5\frac{1}{2}$ yards? *Anſ.* 6,136 *perches.*

The area of a circle given, to find the periphery, or circumference.

RULE. As 113 : 1420, or, as 1 : 12,56637 : : the area to the ſquare of the periphery :—or, multiply the ſquare root of the area by 3,5449, and the product is the circumference.

EXAMPLES.

32. When the area is 12, what is the circumference?
Anſ. 12,2798.

33. When the are is 160, what is the periphery?
Anſ. 44,839.

Any two ſides of a right angled triangle given; to find the third ſide.

1. *The*

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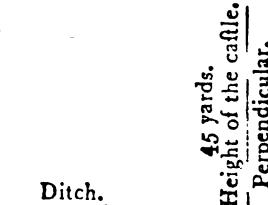
1. *The base and perpendicular given, to find the hypothenuse.*

RULE. The square root of the sum of the squares of the base and perpendicular is the length of the hypothenuse.

EXAMPLES.

34. The top of a castle from the ground is 45 yards high, and surrounded with a ditch 60 yards broad; what length must a ladder be to reach from the outside of the ditch to the top of the castle? *Ans.* 75 *yards.*



35. The wall of a town is 25 feet high, which is surrounded by a moat of 30 feet in breadth: I desire to know the length of a ladder that will reach from the outside of the moat to the top of the wall? *Ans.* 39,05 *feet.*

2. *The hypothenuse and perpendicular given, to find the base.*

RULE. The square root of the difference of the squares of the hypothenuse and perpendicular is the length of the base.

3. *The base and hypothenuse given, to find the perpendicular.*

RULE. The square root of the difference of the squares of the hypothenuse and base is the height of the perpendicular.

N. B. *The two last questions may be varied for examples to the two last propositions.*

Any number of men being given, to form them into a square battle, or to find the number of ranks and files.

RULE. The square root of the number of men given, is the number of men either in rank or file.

36. An army consisting of 331776 men, I desire to know how many rank and file? *Ans.* 576.

37. A certain square pavement contains 48841 square stones, all of the same size, I demand how many are contained in one of the sides? *Ans.* 221.

EXTRACTION

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EXTRACTION *of the* CUBE ROOT.

TO extract the Cube Root is to find out a number, which being multiplied into itself, and then into that product, produceth the given number.

RULE 1. Point every third figure of the cube given, beginning at the unit's place; seek the greatest cube to the first point, and subtract it therefrom; put the root in the quotient, and bring down the figures in the next point to the remainder for a RESOLVEND.

2. Find a DIVISOR by multiplying the square of the quotient by 3. See how often it is contained in the resolvend, rejecting the units and tens, and put the answer in the quotient.

3. To find the SUBTRAHEND. 1. Cube the last figure in the quotient. 2. Multiply all the figures in the quotient by 3, except the last, and that product by the square of the last. 3. Multiply the divisor by the last figure. Add these products together, gives the subtrahend, which subtract from the resolvend; to the remainder bring down the next point, and proceed as before.

ROOTS.	1.	2.	3.	4.	5.	6.	7.	8.	9.
CUBES.	1.	8.	27.	64.	125.	216.	343.	512.	729.

EXAMPLES.

1. What is the cube root of 99252847?

99252847.(463
64 = *cube of* 4

Divisor.
Square of 4×3=48)35252 *resolvend.*

216 = *cube of* 6.
432 = 4×3× *by square of* 6.
288 = *divisor* × *by* 6.

33336 *subtrahend.*

Divisor.
Square of 46 × 3=6348)1916847 *resolvend.*

27 = *cube of* 3.
1242 = 46×3× *by square of* 3.
19044 = *divisor* × *by* 3.

1916847 *subtrahend.*

Another

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Another New *and more* Concise Method *of extracting the* CUBE ROOT.

RULE 1. Point every third figure of the cube given, beginning at the unit's place, then find the highest cube to the first point, and subtract it therefrom, put the root in the quotient, bring down the figures in the next point to the remainder for a resolvend.

2. Square the quotient and triple the square for a divisor, *As* $4\times4\times3=48$. Find how often it is contained in the resolvend, rejecting units and tens, and put the answer in the quotient.

Square the last figure in the quotient, and put it on the right hand of the divisor.

As $6\times6=36$ put to the divisor $48=4836$.

4. Triple the last figure in the quotient, and multiply by the former, put it under the other, units under the tens, add them together, and multiply the sum by the last figure in the quotient, subtract that product from the resolvend, bring down the next point, and proceed as before.

EXAMPLES.

1. What is the cube root of 99252847?

Square of $4\times3=48$ *divisor*
Square of 6 *put to* $48=4836$
$6\times3\times4=72$

5556×6
Square of $46=2116\times3=6348$ *divisor.*
Square of $3=9$ *put to* $6348=*634809$
$8\times3\times46=414$

99252847(463
64

35252
33336

1916847

$638949\times3=1916847.$

2. What is the cube root of 389017? *Ans.* 73.
3. What is the cube root of 5735339? *Ans.* 179.
4. What is the cube root of 32461759? *Ans.* 319.
5. What is the cube root of 84604519? *Ans.* 439.
6. What is the cube root of 259694072? *Ans.* 638.
7. What is the cube root of 48228544? *Ans.* 364.

* *When the quotient is 2 or 3, there must be a cypher put to supply the place of tens.*

8. What

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8. What is the cube root of 27054036008 ? *Anſ.* 3002.
9. What is the cube root of 22069810125 ? *Anſ.* 2805.
10. What is the cube root of 12261532723 2 ? *Anſ.* 4968.
11. What is the cube root of 21936532779 1 ? *Anſ.* 6031.
12. What is the cube root of 673373097125 ? *Anſ.* 8765.

When the given number conſiſts of a whole number and decimal together, make the number of decimals to conſiſt of 3, 6, 9, *&c. places by adding cyphers thereto, ſo that there may be a point fall on the unit's place of the whole number.*

13. What is the cube root of 12,977875 ? *Anſ.* 2,35.
14. What is the cube root of 36155,027576 ? *Anſ.* 33,06+.
15. What is the cube root of ,001906624 ? *Anſ.* 124.
16. What is the cube root of 33,230979637 ? *Anſ.* 3,215+.
17. What is the cube root of 15926,972504 ? *Anſ.* 25,16+.
18. What is the cube root of ,053157376 ? *Anſ.* ,376.

To extract the cube root of a vulgar fraction.

RULE. Reduce the fraction to its loweſt terms, then extract the cube root of its numerator and denominator, for a new numerator and denominator ; but if the fraction be a ſurd, reduce it to a decimal, and then extract the root from it

EXAMPLES.

19. What is the cube root of $\frac{2\,3\,0}{6\,8\,6}$? *Anſ.* $\frac{5}{7}$.
20. What is the cube root of $\frac{3\,2\,4}{1\,5\,0\,0}$? *Anſ.* $\frac{3}{5}$.
21. What is the cube root of $\frac{1\,5\,2\,0}{3\,1\,3\,0}$? *Anſ.* $\frac{2}{3}$.

SURDS.

22. What is the cube root of $\frac{4}{7}$? *Anſ.* ,829+.
23. What is the cube root of $\frac{2}{6}$? *Anſ.* ,822+.
24. What is the cube root of $\frac{2}{3}$? *Anſ.* ,873+.

To extract the cube of a mixed number.

RULE. Reduce the fractional part to its loweſt terms, and then the mixed number to an improper fraction, extract the cube roots of the numerator and denominator for a new numerator and denominator ; but if the mixed number given be a ſurd, reduce the fractional part to a decimal, annex it to the whole number, and extract the root therefrom.

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EXAMPLES.

25. What is the cube root of $12\frac{19}{27}$? *Anſ.* $2\frac{1}{3}$.
26. What is the cube root of $31\frac{1}{343}$? *Anſ.* $3\frac{1}{7}$.
27. What is the cube root of $405\frac{208}{1215}$? *Anſ.* $7\frac{2}{5}$.

SURDS.

28. What is the cube root of $7\frac{1}{5}$? *Anſ.* 1,93+.
29. What is the cube root of $9\frac{1}{6}$? *Anſ.* 2,092+.
30. What is the cube root of $8\frac{5}{7}$? *Anſ.* 2,057+.

The APPLICATION.

1. If a cubical piece of timber be 47 inches long, 47 inches broad, and 47 inches deep, how many cubical inches doth it contain? *Anſ.* 103823.

2. There is a cellar dug, that is 12 feet every way, in length, breadth, and depth, how many ſolid feet of earth were taken out of it? *Anſ.* 1728.

3. There is a ſtone of a cubic form, which contains 389017 ſolid feet, what is the ſuperficial content of one of its ſides? *Anſ.* 5329.

Between two numbers given, to find two mean proportionals.

RULE. Divide the greater extreme by the leſs, and the cube root of the quotient multiplied by the leſs extreme gives the leſs mean; multiply the ſaid cube root by the leſs mean, and the product will be the greater mean proportional.

EXAMPLES.

4. What are the two mean proportionals between 6 and 162? *Anſ.* 18 *and* 54.

5. What are the two mean proportionals between 4 and 108? *Anſ.* 12 *and* 36.

To find the ſide of a cube that ſhall be equal in ſolidity to any given ſolid, as a globe, cylinder, priſm, cone, &c.

RULE. The cube root of the ſolid content of any ſolid body given, is the ſide of the cube of equal ſolidity.

EXAMPLES.

6. If the ſolid content of a globe is 10648, what is the ſide of a cube of equal ſolidity? *Anſ.* 22.

The

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The side of the cube being given, to find the side of the cube that shall be double, treble, &c. in quantity to the cube given.

RULE. Cube the side given, and multiply it by 2, 3, &c. the cube root of the product is the side sought.

EXAMPLES.

7. There is a cubical vessel, whose side is 12 inches, and it is required to find the side of another vessel, that is to contain 3 times as much? *Ans.* 17,306.

EXTRACTING *of the* BIQUADRATE ROOT.

TO extract the Biquadrate Root is to find out a number, which being involved four times into itself, will produce the given number.

RULE. First extract the square root of the given number, and then extract the square root of that square root, and it will give the Biquadrate required.

EXAMPLES.

1. What is the biquadrate of 27? *Ans.* 531441.
2. What is the biquadrate of 76? *Ans.* 33362176.
3. What is the biquadrate of 275? *Ans.* 5719140625.
4. What is the biquadrate root of 531441? *Ans.* 27.
5. What is the biquadrate root of 33362176? *Ans.* 76.
6. What is the biquadrate root of 5719140625? *Ans.* 275.

A general Rule *for* Extracting *the* ROOTS *of all* POWERS.

1. PREPARE the number given for extraction, by pointing off from the unit's place as the root required directs.

2. Find the first figure in the root by the table of powers, which subtract from the given number.

3. Bring down the first figure in the next point to the remainder, and call it the Dividend.

4. Involve the root into the next inferior power to that which is given, multiply it by the given power, and call it the Divisor.

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5. Find a quotient figure by common Diviſion, and annex it to the root; then involve the whole root into the given power, and call that the Subtrahend.

6. Subtract that number from as many points of the given power as is brought down, beginning at the loweſt place, and to the remainder bring down the firſt figure of the next point for a new dividend.

7. Find a new diviſor, and proceed in all reſpects as before.

EXAMPLES.

1. What is the ſquare root of 141376?

141376(376
9
—
6)51 *dividend*
—
1369 *ſubtrahend.*
—
74) 447 *dividend.*
—
141376 *ſubtrahend.*
—

3 × 2=6 *diviſor.*
37 × 37=1369 *ſubtrahend.*
37 × 2=74 *diviſor.*
376 × 376=141376 *ſubtrahend.*

2. What is the cube root of 53157376?

53157376(376
27
—
27)261 *dividend.*
—
50653 *ſubtrahend.*
—
4107)25043 *dividend.*
—
53157376 *ſubtrahend.*
—

3 × 3 × 3= 27 *diviſor.*
37 × 37 × 37= 50653 *ſubtrahend.*
37 × 37 × 3= 4107 *diviſor.*
376 × 376 × 376= 53157376 *ſubtrahend.*

3. What

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3. What is the biquadrate of 19987173376?

19987173376(376
81

108)1188 *dividend.*

1874161 *subtrahend.*

202612)1245563 *dividend.*

19987173376 *subtrahend.*

3 × 3 × 3 × 4 = 108 *divisor.*
37 × 37 × 37 × 37 = 1874161 *subtrahend.*
37 × 37 × 37 × 4 = 202612 *divisor.*
376 × 376 × 376 × 376 = 19987173376 *subtrahend.*

SIMPLE INTEREST.

THERE are five letters to be observed in Simple Interest, viz.

P. the Principal.
T. the Time.
R. the Ratio, or rate *per cent.*
I. the Interest.
A. the Amount.

A TABLE of RATIOS.

3	,03	5½	,055	8	,08
3½	,035	6	,06	8½	,085
4	,04	6½	,065	9	,09
4½	,045	7	,07	9½	,095
5	,05	7½	,075	10	,1

N. B. *The* Ratio *is the Simple Interest of* £1. *for one year, at the* Rate per Cent. *proposed, and is found thus:*

£. £. £.
As 100 : 3 : : 1 : ,03. *As* 100 : 3,5 : : 1 : ,035.

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When the principal, time, and rate per cent. *are given, to find the interest.*

RULE. Multiply the principal, time and rate together, and it will give the interest required.

Note, *The proposition and rule are better expressed thus:*

I. *When* P, T, R, *are given, to find* I.

RULE. *ptr*=I.

NOTE. *When two or more letters are put together like a word, they are to be multiplied one into another.*

EXAMPLES.

1. What is the interest of £945..10..–. for three years, at 5 *per cent. per annum?*

Ans. £945,5×,05×3=141,825 *or* £141..16..6.

2. What is the interest of £547..14..–. at 4 *per cent. per annum*, for 6 years? *Ans.* £131..8..11. 2 *qr.*, 08.

3. What is the interest of £796..15..–. at 4½ *per cent. per annum*, for 5 years? *Ans.* £179..5..4. 2 *qr.*

4. What is the interest of £397..9..5. for two years and ½, at 3½ *per cent. per annum?* *Ans.* £34..15..6. 3,5499 *qr.*

5. What is the interest of £554..17..6. for 3 years, 8 months, at 4½ *per cent. per annum?* *Ans.* £91..11..1.—20.

6. What is the interest of £236..18..8. for 3 years 8 months, at 5½ *per cent. per annum?* *Ans.* £47..15..7. 1,4528 *qr.*

When the interest is for any number of days only.

RULE. Multiply the interest of £1. for 1 day, at the given rate, by the principal and number of days, it will give the answer.

INTEREST OF £1. FOR ONE DAY.

per cent.	*Decimals.*	*per cent.*	*Decimals.*
3	,00008219178	6½	,00017808219
3½	,00009589041	7	,00019178082
4	,00010958904	7½	,00020547945
4½	,00012328767	8	,00021917808
5	,00013698630	8½	,00023287671
5½	,00015068493	9	,00024657534
6	,00016438356	9½	,00026027397

NOTE. *The above Table is thus found:*

As 365 : ,03 : : 1 : ,00008219178. *And as* 365 : ,035 : : 1 : ,00009589041, &c.

EXAMPLES.

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EXAMPLES.

7. What is the interest of £240. for 120 days, at 4 per cent. per annum? *Ans.* 00010958904×240×120=£3..3..1¼.

8. What is the interest of £563. at 6 per cent per annum, for 126 days? *Ans.* £11..13..2½.

9. What is the interest of £560. for 60 days, at 5 per cent. per annum? *Ans.* £4..12..–½.

10. What is the interest of £364..18..–. for 154 days, at 5 per cent. per annum? *Ans.* £7..13..11¼.

11. What is the interest of £725..15..–. for 74 days, at 4 per cent. per annum? *Ans.* £5..17..8½.

12. What is the interest of £100. from the 1st of June, 1775, to the 9th of March following, at 5 per cent. per annum? *Ans.* £3..16..11¾.

II. *When* P, R, T, *are given to find* A.

RULE. $prt+p=A$.

EXAMPLES.

13. What will £279..12..–. amount to in 7 years, at 4½ per cent. per annum? *Ans.* £367..13..5. 3,04 *qrs.*

279,6×,045+279,6=367,674.

14. What will £320..17..–. amount to in 5 years, at 3½ per cent. per annum? *Ans.* £376..19..11. 2,8 *qrs.*

15. What will £679..13..–. amount to in 6 years, at 5 per cent. per annum? *Ans.* £883..10..10. 3,2 *qrs.*

When there is any odd time given with the whole years, reduce the odd time into days, and work with the decimal parts of a year which are equal to those days.

16. What will £926..12..–. amount to in 5 years ½, at 4 per cent. per annum? *Ans.* £1130..9..–. 1,92 *qrs.*

17. What will £368..16..–. amount to in 7 years ¾, at 6½ per cent. per annum? *Ans.* £554..11..7. 3,68 *qrs.*

18. What will £273..18..–. amount to in 4 years, 175 days, at 3 per cent. per annum?

Ans. £310..14..1. 3,35080064 *qrs.*

III. *When* A, R, T, *are given to find* P.

RULE. $\frac{a}{rt+1}=P$.

EXAMPLES.

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EXAMPLES.

19. What principal, being put to interest, will amount to £367..13..5. 3,04 *qrs.* in 7 years, at 4½ per cent. per annum? *Ans.* ,045×7+1=1,315, *then* 367,674÷1,315 =£279..12..–.

20. What principal being put to interest, will amount to £376..19..11. 2,8. in 5 years, at 3½ per cent. per annum? *Ans.* £320..17..–.

21. What principal, being put to interest, will amount to £883..10..10. 3,2 *qrs.* in 6 years, at 5 per cent. per annum? *Ans.* £679..13..–.

22. What principal, being put to interest, will amount to £1130..9..–. 1,92 *qrs.* in 5 years and ½, at 4 per cent. per annum? *Ans.* £926..12..–.

23. What principal will amount to £554..11..7. 3,68 *qrs.* in 7 years ¼, at 6½ per cent. per annum? *Ans.* £368..16–.

24. What principal will amount to £310..14..1. 3,3508006 4 *qrs.* in 4 years, 175 days, at 3 per cent. per annum? *Ans.* £273..18..–.

IV. *When* A, P, T, *are given to find* R.

RULE. $\frac{a-p}{pt}=R.$

EXAMPLES.

25. At what rate per cent. will £279..12..–. amount to £367..13..5. 3,04 *qrs.* in 7 years?

Ans. 367,674—279,6=88,074. 279,6×7=1957,2, *then* 88,074÷1957,2=,045 at 4½ *per cent.*

26. At what rate per cent. will £320..17..–. amount to £376..19..11. 2,8 *qrs.* in 5 years? *Ans.* 3½ *per cent.*

27. At what rate per cent. will £679..13..–. amount to £883..10..10. 3,2 *qrs.* in 6 years? *Ans.* 5 *per cent.*

28. At what rate per cent. will £926..12..–. amount to £1130..9..–. 1,92 *qrs.* in 5 years ¼? *Ans.* 4 *per cent.*

29. At what rate per cent. will £368..16..–. amount to £554..18..7. 3,68 *qrs.* in 7 years ¼? *Ans.* 6½ *per cent.*

30. At what rate per cent. will £273..18..–. amount to £310..14..1. 3,3508006 4 *qrs.* in 4 years, 175 days? *Ans.* 3 *per cent.*

V. *When* A, P, R, *are given to find* T.

RULE. $\frac{a-p}{pr}=T.$

EXAMPLES.

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EXAMPLES.

31. In what time will £279..12..-. amount to £367..13..5. 3,04 *qrs.* at 4½ per cent.? *Anſ.* 367,674—279,6=88,074, 279,6×,045=12,5820 *then* 88,074÷12,5820=7 *years.*

32. In what time will £320..17..-. amount to £376..19..11. 2,8 *qrs.* at 3½ per cent.? *Anſ.* 5 *years.*

33. In what time will £679..13..-. amount to £883..10..10. 3,2 *qrs.* at 5 per cent.? *Anſ.* 6 *years.*

34. In what time will £926..12..-. amount to £1130..9..-. 1,92 *qrs.* at 4½ per cent.? *Anſ.* 5 *years* ½.

35. In what time will £368..16..-. amount to £554..11..7. 3,68 *qrs.* at 6½ per cent.? *Anſ.* 7 *years* ¾.

36. In what time will £273..18..-. amount to £310..14..1. 3,35080064 *qrs.* at 3 per cent.? *Anſ.* 4 *years* 175 *days.*

Annuities *or* Penſions, &c. *in* Arrears.

Annuities or Penſions, &c. are ſaid to be in arrears when they are payable or due, either yearly, half-yearly, or quarterly, and are unpaid for any number of payments.

NOTE. U *repreſents the* annuity, penſion, *or* yearly rent. T, R, A, *as before.*

I, U, R, T, *are given to find* A.

RULE. $\frac{tlu-tu}{2}\times r : +tu=A.$

EXAMPLES.

37. If a ſalary of £150. be forborne 5 years, at 5 per cent. what would it amount to? *Anſ.* £825.

$5\times\frac{5\times150-5\times150}{2}=3000$ then $3000\times,05+5\times150=£825$

38. If £250. yearly penſion be forborne 7 years, what will it amount to in that time, at 6 per cent.? *Anſ.* 2065.

39. There is a houſe let upon a leaſe for 5 years ½, at £60. per annum, what will be the amount of the whole time, at 4½ per cent.? *Anſ.* £363..8..3.

40. Suppoſe an annual penſion of £28. remain unpaid for 8 years, what would it amount at 5 per cent.? *Anſ.* £263..4..-.

Note

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NOTE. *When the annuities, &c. are to be paid half-yearly, or quarterly, then*

For half-yearly payments *take half of the ratio, half of the annuity, &c. and twice the number of years,—and,*

For quarterly payments, *take a fourth part of the ratio, a fourth part of the annuity, &c. and four times the number of years, and work as before.*

EXAMPLES.

41. If a salary of £150. payable every half year, remains unpaid for 5 years, what would it amount to in that time at 5 per cent. ? *Anſ.* £834..7..6.

42. If a salary o £150. payable every quarter, was left unpaid for 5 years, what would it amount to in that time at 5 per cent. ? *Anſ.* £839..1..3.

NOTE. *It may be obſerved, by comparing theſe laſt examples, the amount of the half-yearly payments are more advantageous than the yearly, and the quarterly more than the half-yearly.*

II. *When* A, R, T, *are given, to find* U.

RULE. $\frac{2a}{ttr-tr+2t}=U$

EXAMPLES.

43. If a salary amounted to £825. in 5 years at 5 per cent. what was the salary ? *Anſ.* £150.

$825\times 2=1650.\ 5\times 5\times,05-5\times,05+5\times 2=11$ then $1650\div 11=£.150.$

44. If a houſe is to be let upon a leaſe for 5 years ½, and the amount for that time be £363..8..3. at 4½ per cent. what is the yearly rent ? *Anſ.* £60.

45. If a penſion amounted to £2065. in 7 years, at 6 per cent. what is the penſion ? *Anſ.* £250.

46. Suppoſe the amount of a penſion be £263..4..—. in 8 years, at 5 per cent. what is the penſion ? *Anſ.* £28.

NOTE. *When the payments are half-yearly, then take* 4 a *and half of the ratio, and twice the number of years: and if quarterly, then take* 8 a, *one fourth of the ratio, and four times the number of years, and proceed as before.*

47. If the amount of a salary, payable half-yearly, for 5 years, and at 5 per cent. be £834..7..6. what is the salary ? *Anſ.* £150.

48. If

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48. If the amount of an annuity payable quarterly, be £839..1..3. for 5 years, at 5 per cent. what is the annuity? *Ans.* £150.

III. *When* U, A, T, *are given, to find* R.

RULE. $\frac{2a-2ut}{utt-ut}=R.$

EXAMPLES.

49. If a salary of £150. per annum, amount to £825. in 5 years, what is the rate per cent.? *Ans. 5 per cent.*

$825\times2-150\times5\times2=150$ *then* $\frac{150\times5\times5-150\times5}{150}=,05$

50. If a house be let upon lease for $5\frac{1}{2}$ years, at £60. per annum, and the amount for that time be £363..8..3. what is the rate per cent.? *Ans.* $4\frac{1}{2}$ *per cent.*

51. If a pension of £250. per annum amounts to £2065. in 7 years, what is the rate per cent.? *Ans.* 6 *per cent.*

52. Suppose the amount of an yearly pension of £28. be £263..4. 0. in 8 years, what is the rate per cent.? *Ans. 5 per cent.*

NOTE. *When the payments are half-yearly, take* 4 a—4 ut *for a dividend, and work with half the annuity, and double the number of years for a divisor; if quarterly, take* 8 a—8 ut, *and work with a fourth of the annuity, and four times the number of years.*

53. If a salary of £150, per annum, payable half-yearly, amounts to £834..7..6. in 5 years, what is the rate per cent.? *Ans. 5 per cent.*

54. If an annuity of £150. per annum, payable quarterly, amounts to £839..1..3. in 5 years, what is the rate per cent.? *Ans.* 5 *per cent.*

IV. *When* U, A, R, *are given, to find* T.

RULE. *First,* $\frac{2}{r}-1=x$ *: then* $\sqrt{\frac{2a}{ur}+\frac{xx}{4}}-\frac{x}{2}=T.$

EXAMPLES.

55. In what time will a salary of £150. per annum amount to £825. at 5 per cent.? *Ans. 5 years.*

56. If

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$$\frac{2}{,05} - 1 \times 39 \frac{825 \times 2}{150 \times ,05} = 220 \frac{39 \times 39}{4} = 580,25$$

$$\sqrt{220 + 380,25} = 24,5 - \frac{39}{2} = 5 \text{ years.}$$

56. If a houſe is let upon a leaſe for a certain time for £60. per annum, and the amount be £363..8..3. at 4½ per cent. what time was it let for? *Anſ.* 5½ *years.*

57. If a penſion of £250. per annum, being forborne a certain time, amounts to £2065. at 6 per cent. what was the time of forbearance? *Anſ.* 7 *years.*

58. In what time will a yearly penſion of £28. amount to £263..4..0. at 5 per cent.? *Anſ.* 8 *years.*

Note. *If the payments are half-yealy, take half the ratio and half the annuity; if quarterly, one fourth of the ratio, and one fourth of the annuity; and* T *will be equal to thoſe half-yearly or quarterly payments.*

59. If an annuity of £150. per annum, payable half-yearly, amounts to £834..7..6. at 5 per cent. what time was the payment forborne? *Anſ.* 5 *years.*

60. If a yearly penſion of £150. payable quarterly, amounts to £839..1..3. at 5 per cent. what was the time of forbearance? *Anſ.* 5 *years.*

Preſent Worth of ANNUITIES.

Note. P *repreſents the preſent worth;* U, T, R, *as before.*

I. *When* U, T, R, *are given to find* P.

RULE. $\frac{ttr - tr + 2t}{2tr + 2} : \times u = P.$

EXAMPLES.

61. What is the preſent worth of £150. per annum, to continue 5 years at 5 per cent.? *Anſ.* £660.

$5 \times 5 \times ,05 - 5 \times ,05 + 5 \times 2 = 11.$ $5 \times ,05 \times 2 + 2 = 2,5.$

Then $11 \div 2,5 \times 150 = £660.$

62. What is the yearly rent of a houſe of £60. to continue 5½ years, worth in ready money, at 4½ per cent.? *Anſ.* £291..6..3.

63. What is the preſent worth of £250. per annum, to continue 7 years, at 6 per cent.? *Anſ.* £1454..4..6.

64. What is a penſion of £28. per annum worth in ready money, at 5 per cent. for 8 years? *Anſ.* £188.

Note.

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Note. *The same thing is to be observed as in the first rule of annuities in arrears, concerning half-yearly and quarterly payments.*

65. What is the present worth of £150. payable half-yearly, for 5 years, at 5 per cent.? *Ans.* £667..10..-.

66. What is the present worth of £150. payable quarterly for 5 years, at 5 per cent.? *Ans.* £671..5..-.

Note. *By comparing the last examples it will be found, that the present worth of half-yearly payments is more advantageous than yearly; and quarterly than half-yearly.*

II. *When* P, T, R, *are given to find* U,

RULE. $\frac{tr+1}{ttr-tr+2t} : \times 2p = U.$

EXAMPLES.

67. If the present worth of a salary be £660. to continue 5 years, at 5 per cent. what was the salary? *Ans.* £150.

$$5\times,05+1=1,25.\ 5\times 5\times,05-5\times,05+10=11.$$

$$\text{then}\ \frac{1,25}{11}=660\times 2=150.$$

68. There is a house let upon lease, for $5\frac{1}{2}$ years to come, I desire to know the yearly rent, when the present worth, at $4\frac{1}{2}$ per cent. is £291..6..3? *Ans.* £60.

69. What annuity is that which for 7 years continuance, at 6 per cent. produces £1454..4..6. present worth? *Ans.* £250.

70. What annuity is that which for 8 years continuance, produces £188. for the present worth, at 5 per cent.? *Ans.* £28.

Note. *When the payments are half-yearly, take half the ratio, twice the number of years, and multiply by* 4 p; *and when quarterly, take one fourth of the ratio, four times the number of years, and multiply by* 8 p.

71. There is an annuity payable half-yearly, for 5 years to come, what is the yearly rent, when the present worth, at 5 per cent. is £667..10..-.? *Ans.* £150.

72. There is an annuity payable quarterly, for 5 years to come, I desire to know the yearly income, when the present worth, at 5 per cent. is £671..5..-.? *Ans.* £150.

III. *When* U, P, T, *are given, to find* R.

RULE. $\frac{ut-p\times 2}{2pt+ut-ut} = R$

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EXAMPLES.

73. At what rate per cent. will an annuity of £150. per annum, to continue 5 years, produce the present worth of £660.? *Ans.* 5 *per cent.*

$$\overline{150\times5}-\overline{660\times2}=180.\overline{2\times660\times5}+\overline{150\times5}-\overline{150\times5\times5}$$
$$=3600 \textit{ then } 180\div3600=,05=5 \textit{ per cent.}$$

74. If a yearly rent of £60. per annum, to continue $5\frac{1}{2}$ years produce £291..6..3. for the present worth, what is the rate per cent.? *Ans.* $4\frac{1}{2}$ *per cent.*

75. If an annuity of £250. per annum, to continue 7 years, produce £1454..4..6. for the present worth, what is the rate per cent.? *Ans.* 6 *per cent.*

76. If a pension of £28. per annum, to continue 8 years, produces £188. for the present worth, what is the rate per cent.? *Ans.* 5 *per cent.*

Note. *When the annuities or rents,* &c. *are to be paid half-yearly, or quarterly, then*

For half-yearly payments, *take half of the annuity,* &c. *and twice the number of years, the quotient will be the ratio of half the rate* per cent.—*and,*

For quarterly payments, *take a fourth part of the annuity,* &c. *and four times the number of years, the quotient will be the ratio of the fourth part of the rate* per cent.

77. If an annuity of £150. per annum, payable half-yearly, having 5 years to come, is sold for £667..10..-. what is the rate per cent.? *Ans.* 5 *per cent.*

78. If an annuity of £150. per annum, payable quarterly, having 5 years to come, is sold for £671..5..--. what is the rate per cent.? *Ans.* 5 *per cent.*

IV. *When* U, P, R, *are given, to find* T.

RULE. $\overline{\frac{2}{r}-\frac{2p}{u}-1}=x$ *then* $\sqrt{\frac{2p}{ur}+\frac{xx}{4}}-\frac{x}{2}=T.$

EPAMPLES.

79. If an annuity of £150. per annum produce £660. for the present worth, at 5 per cent. what is the time of its continuance? *Ans.* 5 *years.*

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$$\frac{2}{,95} \quad \frac{660 \times 2}{150} - 1 = 30,2 \qquad \frac{660 \times 2}{150 \times ,05} = 176$$

$$\frac{30,2 \times \frac{30,2 \times 4}{2}}{} = 228,01 \text{ then } \sqrt{228,01} + 176 = 20,1$$

$$20,1 - \frac{\frac{30,2}{2}}{} = 5 \text{ years.}$$

80. For what time may a ſalary of £60. be purchaſed for £291..6..3. at 4½ per cent.? *Anſ.* 5½ *years.*

81. For how long a time may £250. per annum be purchaſed for £1454..4..6. at 6 per cent.? *Anſ.* 7 *years.*

82. What time may a penſion of £28. per annum be purchaſed for £188. at 5 per cent.? *Anſ.* 8 *years.*

NOTE. *When the payments are half-yearly, then* U *will be equal to the half annuity,* &c. R *half the ratio, and* T *the number of payments; and*

When the payments are quarterly, U *will be equal to a fourth part of the annuity,* &c. R *the fourth of the ratio, and* T *the number of payments.*

83. If an annuity of £150. per annum, payable half-yearly, is ſold for £667..10..–. at 5 per cent. I deſire to know the number of payments, and the time to come?

Anſ. 10 *payments,* 5 *years.*

84. An annuity of £150. per annum, payable quarterly, is ſold for £671..5..–. at 5 per cent. what is the number of payments and time to come? *Anſ.* 20 *payments,* 5 *years.*

ANNUITIES, &c. *taken in* REVERSION.

1. *To find the preſent worth of an annuity,* &c. *taken in reverſion.*

RULE. Find the preſent worth of the yearly ſum at the given rate, and for the time of its continuance, *thus,*

$$\frac{ttr - tr + 2t}{2tr + 2} : \times u = P.$$

2. Change P. into A. and find what principal being put to intereſt will amount to A. at the ſame rate, and for the time to come before the annuity, &c. commences, *thus,*

$$\frac{a}{tr + 1} = P.$$

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EXAMPLES.

85. What is the preſent worth of an annuity of £150. per annum, to continue 5 years, but not to commence till the end of 4 years, allowing 5 per cent. to the purchaſer?

Anſ. £550.

$$\frac{5\times5\times,05-5\times,05+2\times5}{5\times,05\times2+2}=4,4\times150=\frac{160}{4\times,05+1}=550.$$

86. What is the preſent worth of a leaſe of £60. per annum, to continue 4 years, but is not to commence till the end of 5 years, allowing 4 per cent. to the purchaſer?

Anſ. £152..5..11. 3 *qrs.*

87. A perſon having the promiſe of a penſion of £20. per annum, for 8 years, but not to commence till the end of 4 years, is willing to diſpoſe of the ſame, at 5 per cent. what will be the preſent worth? *Anſ.* £111..18. 1. 14+.

88. A legacy of £40. being left for 6 years to a perſon of 15 years of age, but is not to commence till he is 21: he wanting money, is deſirous of ſelling the ſame at 4 per cent. what is the preſent worth? *Anſ.* £171..14..-.

2. *To find the yearly income of an annuity*, &c. *in reverſion.*

RULE. 1. Find the amount of the preſent worth at the given rate, and for the time before the reverſion, *thus*, $ptr+p=A.$

2. Change A. into P. and find what annuity being ſold will produce P. at the ſame rate, and for the time of its continuance, *thus*, $\frac{tr+1}{ttr-tr+2t}:\times2p=U.$

EXAMPLES.

89. A perſon having an annuity left him for 5 years, which does not commence till the end of 4 years, diſpoſed of it for £550. allowing 5 per cent. to the purchaſer, what was the yearly income? *Anſ.* 150.

$$550\times4\times,05+550=660$$

$$\frac{5\times,05+1}{5\times5\times,05-5\times,05+5\times2}=,113636\times660\times2=£150.$$

90. There

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90. There is a leafe of a houfe taken for 4 years, but not to commence till the end of 5 years, the leſſee would ſell the ſame for £152..6–. preſent payment, allowing 4 per cent. to the purchaſer, what is the yearly rent? *Anſ.* £50.

91. A perſon having the promiſe of a penſion for 8 years, which does not commence till the end of 4 years, has diſpoſed of the ſame for £111..18..1. 14 preſent money, allowing 5 per cent. to the purchaſer, what was the penſion? *Anſ.* £20.

92. There is a certain legacy left to a perſon of 15 years of age, which is to be continued for 6 years, but not to commence till he arrives at the age of 21; he wanting a ſum of money, ſells it for £171..14..–. allowing 4 per cent. to the buyer, what was the annuity left him? *Anſ.* £40.

REBATE *or* DISCOUNT.

NOTE. S repreſents the ſum to be diſcounted.
P the preſent worth.
T the Time.
R the Ratio.

I. *When* S, T, R, *are given, to find* P.

RULE. $\frac{S}{tr+1}=P.$

EXAMPLES.

1. What is the preſent worth of £357..10..–. to be paid 9 months hence, at 5 per cent.? *Anſ.* £334..11..6. 3,168 *qrs.*

$$\frac{357,5}{,75\times,05+1}=344,5783.$$

2. What is the preſent worth of £275..10–. due 7 month hence, at 5 per cent.? *Anſ.* £267..13..10. ,164*d.*

3. What is the preſent worth of £875..5..6. due 5 months hence, at $4\frac{1}{2}$ per cent.? *Anſ.* £859..3..3. 3,2544 *qrs.*+

4. How much ready money can I receive for a note of £75. due 15 months hence, at 5 per cent.?
Anſ. £70..11..9. ,1764*d.*

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II. *When* R, P, T, *are given, to find* S.

RULE. $ptr+p=S$.

EXAMPLES.

5. If the present worth of a sum of money due 9 months hence, allowing 5 per cent. be £344..11..6. 3,168 *qrs.* what was the sum first due? *Ans.* £357..10..–.

$344{,}5783\times{,}75\times{,}05+344{,}5783=$£357..10..–.

6. A person owing a certain sum, payable 7 months hence, agrees with the creditor to pay him down £267..13..10,164*d.* allowing 5 per cent. for present payment, what is the debt? *Ans.* £275..10..–.

7. A person receives £859..3..3. 3,254 *qrs.* for a sum of money due 5 months hence, allowing the debtor $4\frac{1}{2}$ per cent. for present payment, what was the sum due? *Ans.* £875..5..6.

8. A person paid £70..11..9. ,1764 for a debt due 15 months hence, he being allowed 5 per cent. for the discount, how much was the debt? *Ans.* £75.

III. S, P, T, *are given, to find* R.

RULE. $\frac{s-p}{tp}=R$.

EXAMPLES.

9. At what rate per cent. will £357..10..–. payable 9 months hence, produce £344..11..6. 3,168 *qrs.* for present payment? *Ans.* 5 *per cent.*

$$\frac{357{,}5-344{,}5783}{344{,}5783\times{,}75}={,}05=5 \text{ per cent.}$$

10. At what rate per cent. will £275..10..–. payable 7 months hence, produce £267..13..10,164*d.* for the present payment? *Ans.* 5 *per cent.*

11. At what rate per cent. will £875..5..6. payable 5 months hence, produce the present payment of £859..3..3. 3,2544 *qrs.*? *Ans.* $4\frac{1}{2}$ *per cent.*

12. At what rate per cent. will £75. payable 15 months hence, produce the present payment of £70..11..9. 1764? *Ans.* 5 *per cent.*

IV. *When*

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IV. *When* S, P, R, *are given to find* T.

RULE. $\frac{s-p}{rp}=T.$

EXAMPLES.

13. The present worth of £357..10..-. due for a certain time to come, is £344..11..6. 3,168 *qrs.* at 5 per cent. in what time should the sum have been paid without any rebate?

Anſ. 9 *months.*

$$\frac{357,5-344,5783}{344,5783\times,05}=,75=9 \text{ months.}$$

14. The present worth of £275..10..-. due for a certain time to come, is £267..13..10.,164*d.* at 5 per cent. in what time should the sum have been paid without any rebate?

Anſ. 7 *months.*

15. A person receives £859..3..3..3. 3,2544 *qrs.* for £875..5..6. due at a certain time to come, allowing $4\frac{1}{2}$ per cent. discount, I desire to know in what time the debt should have been discharged without any rebate? *Anſ.* 5 *months.*

16. I have received £70..11. 9.,1752*d.* for a debt of £75. allowing the person 5 per cent. for prompt payment, I desire to know when the debt would have been payable without the rebate?

Anſ. 15 *months.*

EQUATION of PAYMENTS.

To find the equated time for the Payment of a ſum of money due at ſeveral times.

RULE. Find the present worth of each payment for its respective time, *thus* $\frac{s}{tr+1}=P.$

Add all the present worths together, *then,* $s-p=D.$

and $\frac{d}{pr}=E.$

EXAMPLES.

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EXAMPLES.

1. D owes E £200. whereof £40. is to be paid at 3 months, £60. at 6 months, and £100. at 9 months; at what time may the whole debt be paid together, rebate being made at 5 per cent.? *Anf.* 6 *months* 26 *days.*

$$\frac{40}{1,0125}=39,5061 \qquad \frac{60}{1,025}=58,5365 \qquad \frac{100}{1,0375}=96,3855$$

then $200-39,5061+58,5365+96,3855=5,5719$

$$\frac{5,5719}{194,4281\times,05}=,57315=6 \text{ months } 26 \text{ days.}$$

2. D owes F £800. whereof £200. is to be paid in 3 months, £200. at 4 months, and £400. at 6 months; but they agreeing to make but one payment in the whole, at the rate of 5 per cent. rebate, the true equated time is demanded? *Anf.* 4 *months*, 22 *days.*

3. E owes F £1200. which is to be paid as follows: £200. down, £500. at the end of 10 months, and the reft at the end of 20 months; but they agreeing to have one payment of the whole, rebate at 3 per cent. the true equated time is demanded? *Anf.* 1 *year*, 11 *days.*

COMPOUND INTEREST.

THE letters made uſe of in Compound Intereſt, are,

A the Amount.
P the principal.
T the Time.
R the Amount of £1. for 1 year, at any given rate; which is thus found:

As 100 : 105 : : 1 : 1,05. As 100 : 105,5 : : 1 : 1,055.

A TABLE of the amount of £1. for One Year.

Rates per cent.	*Amts. of £1.*	*Rates per cent.*	*Amts. of £1.*	*Rates per cent.*	*Amts. of £1.*
3	1,03	5½	1,055	8	1,08
3½	1,035	6	1,06	8½	1,085
4	1,04	6½	1,065	9	1,09
4½	1,045	7	1,07	9½	1,095
5	1,05	7½	1,075	10	1,1

A TABLE,

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A TABLE, ſhewing the amount of £1. for any number of years under 31, at 5 and 6 per cent. per annum.

Years.	5 *Rates* 6		*Years.*	5 *Rates* 6	
1	1,05000	1,06000	16	2,18287	2,54035
2	1,10250	1,12360	17	2,29201	2,69277
3	1,15762	1,19101	18	2,40662	2,85434
4	1,21550	1,26247	19	2,52695	3,02559
5	1,27628	1,33822	20	2,65329	3,20713
6	1,34009	1,41852	21	2,78596	3,39956
7	1,40710	1,50363	22	2,92526	3,60353
8	1,47745	1,59384	23	3,07152	3,81975
9	1,55132	1,68948	24	3,22510	4,04893
10	1,62889	1,79084	25	3,38635	4,29187
11	1,71034	1,89829	26	3,55567	4,54938
12	1,79585	2,01219	27	3,73345	4,82234
13	1,88565	2,13292	28	3,92013	5,11168
14	1,97993	2,26090	29	4,11613	5,41838
15	2,07892	2,39655	30	4,32194	5,74349

NOTE, *The above Table is thus made:* As 100 : 105 : : 1 : 1,05 *for the firſt year; then,* As 110 : 105 : : 1,05 : 1,025, *ſecond year,* &c.

I. *When* P, T, R, *are given, to find* A.

RULE. $p \times rt = A$.

EXAMPLES.

1. What will £225. amount to in 3 years time, at 5 per cent. per annum? *Anſ.* 1,05×1,05×1,05=1,157625, *then* 1,157625×225=£260..9..3. 3 *qrs.*

2. What will £200. amount to in 4 years, at 5 per cent. per annum? *Anſ.* £243. 2,0255.

3. What will £450. amount to in 5 years, at 4 per cent. per annum? *Anſ.* 547..9..10. 2,0538368 *qrs.*

4. What will £500. amount to in 4 years, at 5½ per cent. per annum? *Anſ.* £619..8..2. 3,8323 *qrs.*

II. *When* A, R, T, *are given, to find* P.

RULE. $\frac{a}{rt} = P$.

EXAMPLES.

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EXAMPLES.

5. What principal being put to interest will amount to £260..9..3. 3 *qrs.* in 3 years, at 5 per cent. per annum?

$1{,}05 \times 1{,}05 \times 1{,}05 = 1{,}157625.$ $\frac{260{,}465625}{1{,}157625} = £225.$

6. What principal being put to interest will amount to £243. 2,0255. in 4 years, at 5 per cent. per annum? *Ans.* £200.

7. What principal will amount to £547 .. 9 .. 10. 2,0538368 *qrs.* in 5 years, at 4 per cent. per annum? *Ans.* 450.

8. What principal will amount to £619..8..2. 3,8323 *qrs.* in 4 years, at 5½ per cent.? *Ans.* £500.

III. *When* P, A, T, *are given, to find* R.

RULE.—$\sqrt[t]{\frac{a}{p}} = r$, *which being extracted by the rule of extraction, (the time given to the question shewing the power) will give* R.

EXAMPLES.

9. At what rate per cent. will £225. amount to £260..9..3. 3 *qrs.* in 3 years? *Ans.* 5 *per cent.*

$\frac{260{,}465625}{225} = 1{,}157625$, *the cube root of which (it being the 3d power)* $= 1{,}05 = 5$ *per cent.*

10. At what rate per cent. will £200. amount to £243. 2,0255. in 4 years? *Ans.* 5 *per cent.*

11. At what rate per cent. will £450. amount to £547..9..10. 2,0538368 *qrs.* in 5 years? *Ans.* 4 *per cent.*

12. At what rate per cent. will £500. amount to £619..8..2. 3,8323 *qrs.* in 4 years? *Ans.* 5½ *per cent.*

IV. *When* P, A, R, *are given, to find* T.

RULE.—$\frac{a}{p} = r^t$. *which being continually divided by* R *till nothing remains, the number of those divisions will be equal to* T.

EXAMPLES.

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EXAMPLES.

13. In what time will £225. amount to £260..9..3. 3 *qrs.* at 5 per cent.?

$$\frac{260,465625}{225}=1,157625=\frac{1,157625}{1,05}=1,1025=\frac{1,1025}{1,05}=1,05$$

$=1$. *The number of divisions being* 3$=$*time sought.*

14. In what time will £200. amount to £243. 2,0255. at 5 per cent.? *Ans.* 4 *years.*

15. In what time will £150. amount to £547..9..10. 2,0538368 *qrs.* at 4 per cent.? *Ans.* 5 *years.*

16. In what time will £500. amount to £612..8..2. 3,38323 *qrs.* at 5½ per cent.? *Ans.* 4 *years.*

ANNUITIES, *or* PENSIONS *in* ARREARS.

NOTE. U *represents the annuity, pension, or yearly rent;* A, R, T, *as before.*

A TABLE shewing the amount of £1. annuity for any number of years under 31, at 5 and 6 per cent. per annum.

Yrs.	5 *Rates*	6	*Yrs.*	5 *Rates*	6
1	1,00000	1,00000	16	23,65748	25,67252
2	2,05000	2,06000	17	25,84035	28,21288
3	3,15250	3,18360	18	28,13237	30,90565
4	4,31012	4,37461	19	30,53899	33,75999
5	5,52563	5,63709	20	33,06593	36,78559
6	6,80191	6,97532	21	35,71921	39,99272
7	8,14200	8,39383	22	38,50521	43,39229
8	9,54910	9,89746	23	41,43047	46,99582
9	11,02656	11,49131	24	44,50199	50,81557
10	12,57789	13,18079	25	47,72709	54,86451
11	14,20678	14,97164	26	51,11345	59,15638
12	15,91712	16,86994	27	54,66913	63,70576
13	17,71298	18,88213	28	58,40258	68,52811
14	19,59863	21,01506	29	62,32271	73,63979
15	21,57856	23,27597	30	66,43884	79,05818

NOTE. *The above Table is made thus: take the first year's amount, which is* £1. *multiply it by* 1,05+1=2,05= *second year's amount, which also multiply by* 1,05+1=3,1525=*third year's amount.*

I. *When*

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I. *When* U, T, R, *are given, to find* A.

$$\text{RULE.} \quad \frac{urt-u}{r-1} = A, \text{ or by the Table thus,}$$

Multiply the amount of £1. for the number of years, and at the rate per cent. given in the queſtion, by the annuity, penſion, &c. and it will give the anſwer.

EXAMPLES.

17. What will an annuity of £50. per annum, payable yearly, amount to in 4 years, at 5 per cent.?

Anſ. $1,05\times1,05\times1,05\times1,05\times50=60,77531250$

then $\frac{60,7753125-50}{1,05-1}=$£215..10..1. 2 *qrs.* or,

by the Table thus, $4,31012\times50=$£215..10..1. 1,76 *qrs.*

18. What will a penſion of £45. per annum, payable yearly, amount to in 5 years, at 5 per cent.

Anſ. 248..13..0. 3,27 *qrs.*

19. If a ſalary of £50. per annum, to be paid yearly, be forborne 6 years, at 6 per cent. what is the amount?

Anſ. £279..0. 3,072*d.*

20. If an annuity of £75. per annum, payable yearly, be omitted to be paid for 10 years, at 6 per cent. what is the amount? *Anſ.* 988..11..0. 2,22*d.*

II. *When* A, R, T, *are given, to find* U.

$$\text{RULE.} \quad \frac{ar-a}{rt-1} = U$$

EXAMPLES.

21. What annuity, being forborne 4 years, will amount to £215..10..1. 2 *qrs.* at 5 per cent.?

$$\text{Anſ.} \quad \frac{215,50625\times1,05-215,50625}{1,05\times1,05\times1,05\times1,05-1}=£50.$$

22. What

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22. What penſion being forborne 5 years will amount to £248..13...-. 3,27 *qrs.* at 5 per cent. ? *Anſ.* £45.

23. What ſalary being omitted to be paid 6 years, will amount to £279...-.3,072*d.* at 6 per cent. ? *Anſ.* £40.

24. If the payment of an annuity be forborne 10 years amount to £988..11...-. 2,22*d.* at 6 per cent. what is the annuity? *Anſ.* £75.

III. *When* U, A, R, *are given, to find* T.

RULE. $\frac{ar+u-a}{u}=rt$ *which being continually divided by* R, *till nothing remains, the number of thoſe diviſions will be equal to* T.

EXAMPLES.

25. In what time will £50. per annum amount to £215..10..1. 2 *qrs.* at 5 per cent. for non-payment?

Anſ. $\frac{215,50625\times 1,05+50-215,50625}{50}=1,21550625$

which being continually divided by R, *the number of thoſe diviſions will be* = 4 *years.*

26. In what time will £45. per annum amount to £248..13...-. 3,27 *qrs.* allowing 5 per cent. for forbearance of payment? *Anſ.* 5 *years.*

27. In what time will £40. per annum amount to £279...-. 3,072, at 6 per cent. ? *Anſ.* 6 *years.*

28. In what time will £75. per annum amount to £988..11. 2,22*d.* allowing 6 per cent. for forbearance of payment? *Anſ.* 10 *years.*

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PRESENT WORTH of ANNUITIES, PENSIONS, &c.

A TABLE ſhewing the preſent worth of £1. annuity for any number of years under 31, rebate at 5 and 6 per cent.

Yrs.	5 *Rates* 6		*Yrs.*	5 *Rates* 6	
1	0,95238	0,94339	16	10,83777	10,10589
2	1,85941	1,83339	17	11,27406	10,47726
3	2,72324	2,67301	18	11,68958	10,82760
4	3·54595	3,46510	19	12,08532	11,15811
5	4,32947	4,21236	20	12,46221	11,46992
6	5,07569	4,91732	21	12,82115	11,76407
7	5,78637	5,58238	22	13,16300	12,04158
8	6,46321	6,20979	23	13,48857	12,30338
9	7,10782	6,80169	24	13,79864	12,55035
10	7,72173	7,36008	25	14,09394	12,78335
11	8,30641	7,88687	26	14,37518	13,00316
12	8,86325	8,38384	27	14,64303	13,21053
13	9,39357	8,85268	28	14,89812	13,40616
14	9,89864	9,29498	29	15,14107	13,59072
15	10,37965	9,71225	30	15,37245	13,76483

Note. *The above table is thus made: divide* £1. *by* 1,05 =,95238, *the preſent worth of the firſt year, which* ÷ 1,05, =90703, *added to the firſt year's preſent worth* = 1,85941, *the ſecond year's preſent worth: then,* 90703÷105, *and the quotient added to* 1,85941=2,72324, *third year's preſent worth,* &c.

I. *When* U, T, R, *are given, to find* P.

RULE. $$\frac{u - \frac{u}{rt}}{r-1} = P.$$

or, by the Table, thus,

Multiply the preſent worth of £1. annuity for the time and rate per cent. given by the annuity, penſion, &c. it will give the anſwer.

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EXAMPLES.

29. What is the present worth of an annuity of £30. per annum, to continue 7 years, at 6 per cent.?

Ans. £167. 9..5.,184*d.*

$\frac{30}{1,50363} = 19,9517.$ $30 - 19,9517 = 10,0483$ $\frac{10,0483}{1,06 - 1}$

$= 167,4716.$ *By the Table* $5,53238 \times 30 = 167,4716.$

30. What is the present worth of a pension of £40. per annum, to continue 8 years, at 5 per cent.?

Ans. £258..10..6. 3,264 *qrs.*

31. What is the present worth of a salary of £35. to continue 7 years, at 6 per cent.? *Ans.* £195..7..7. 3,968 *qrs.*

32. What is the yearly rent of £50. to continue 5 years, worth in ready money, at 5 per cent.?

Ans. £216..9..5. 2,56 *qrs.*

II. *When* P, T, R, *are given to find* U.

RULE. $\frac{prt \times r - prt}{rt - 1} = U.$

EXAMPLES.

33. If an annuity be purchased for £167..9..5.,184*d.* to be continued 7 years, at 6 per cent. what is the annuity?

Ans. $\frac{167,4716 \times 1,50363 \times 1,06 - 167,4716 \times 1,50363}{1,50363 - 1} = £30.$

34. If the present payment of £258..10..6. 3,64 *qrs.* be made for a salary 8 years to come, at 5 per. cent. what is the salary? *Ans.* £40.

35. If the present payment of £195..7..7. 3,968 *qrs.* were required for a pension for 7 years to come, at 6 per cent. what is the pension? *Ans.* £35.

36. If the present worth of an annuity, 5 years to come, be £216..9..5. 2,56 *qrs.* at 5 per cent. what is that annuity?

Ans. £50.

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III. *When* U, P, R, *are given to find* T.

RULE. $\frac{u}{p+u-pr} = rt$ *which being continually divided by* R, *till nothing remains, the number of thoſe diviſions will be equal to* T.

EXAMPLES.

37. How long may a leaſe of £30. yearly rent be had for £167..9..5. ,184*d*. allowing 6 per cent. to the purchaſer?

Anſ. $\frac{30}{167,4716+30-177,5198} = 1,50363$ *which being continually divided, the number of thoſe diviſions will be* =*to* T.=7 *years.*

38. If £258..10..6. 3,264 *qrs.* is paid down for a leaſe of £40. per annum, at 5 per cent. how long is the leaſe purchaſed for? *Anſ.* 8 *years.*

39. If a houſe is let upon leaſe for £35. per annum, and the leſſee makes preſent payment of £195..7..8. he being allowed 6 per cent. I demand how long the leaſe is purchaſed for? *Anſ.* 7 *years.*

40. For what time may a leaſe of £50. per annum be purchaſed, when preſent payment is made of £216..9..5. 2,56 *qrs.* at 5 per cent.? *Anſ.* 5 *years.*

ANNUITIES, LEASES, *&c. taken in* REVERSION.

To find the preſent worth of annuities, leaſes, &c. taken in reverſion.

RULE. Find the preſent worth of the annuity, &c. at the given rate, and for the time of its continuance; *thus,*

$$\frac{u - \frac{u}{rt}}{r-1} = P.$$

2. Change P into A, and find what principal being put to intereſt will amount to P at the ſame rate, and for the time to come, before the annuity commences, which will be the preſent worth of the annuity &c. *thus,*

$$\frac{a}{rt} = R.$$

EXAMPLES.

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EXAMPLES.

41. What is the present worth of a reversion of a lease of £40. per annum, to continue for 6 years, but not to commence till the end of 2 years, allowing 6 per cent. to the purchaser? *Ans.* £175..1..1. 2048 *qrs.*

$\frac{40}{1,41852}=28,1984.$ $\frac{40-28,1984}{1,06-1}=196,6933.$ $\frac{196,6933}{1,1236}$

$=175,0563.$

42. What is the present worth of a reversion of a lease of £60. per annum, to continue 7 years, but not to commence till the end of 3 years, allowing 5 per cent. to the purchaser? *Ans.* £299..18.. 2,4*d*.

43. There is is a lease of a house at £30. per annum, which is yet in being for 4 years, and the lessee is desirous to take a lease in reversion for 7 years, to begin when the old lease shall be expired, what will be the present worth of the said lease in reversion, allowing 5 per cent. to the purchaser? *Ans.* £142..16..3. 2,688. *qrs.*

To find the yearly income of an annuity, &c. *taken in reversion.*

RULE. Find the amount of the present worth, at the given rate, and for the time before the annuity commences, *thus*, $prt=A.$

Change A into P, and find what yearly rent being sold will produce P, at the same rate, and for the time of its continuance, which will be the yearly sum required. *thus*, $\frac{prt\times r-prt}{rt-1}=U.$

EXAMPLES.

44. What annuity to be entered upon 2 years hence, and then to continue 6 years, may be purchased for £175..1..1. 2,048 *qrs.* at 6 per cent.?

Ans. $175,0563\times 1,1236=196,6933$

then $\frac{196,6933\times 1,41852\times 1,06-279,01337}{1,41852-1}=£40.$

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45. The preſent worth of a leaſe of a houſe is £299..18. 2,4*d*. taken in reverſion for 7 years, but not to commence till the end of three years, allowing 5 per cent. to the purchaſer, what is the yearly rent? *Anſ.* £60.

46. There is a leaſe of a houſe in being for 4 years, and the leſſee being minded to take a leaſe in reverſion for 7 years, to begin when the old leaſe ſhall be expired, paid down £142..16..3. 2,688 *qrs.* what was the yearly rent of the houſe, when the leſſee was allowed 5 per cent. for preſent payment? *Anſ.* 30.

Purchaſing FREEHOLD *or* REAL ESTATES, *is ſuch as is bought to continue for ever.*

I. *When* U, R, *are given, to find* W.

RULE. $\frac{u}{r-1}=W.$

EXAMPLES.

47. What is the worth of a freehold eſtate of £50. per annum, allowing 5 per cent. to the buyer?

Anſ. $\frac{50}{1,05-1}=£1000.$

48. What is an eſtate of £140. per annum, to continue for ever, worth in preſent money, allowing 4 per cent. to the buyer? *Anſ.* £3500.

49. If a freehold eſtate of £75. yearly rent was to be ſold, what is the worth, allowing the buyer 6 per cent. *Anſ.* £1250.

II. *When* W, R, *are given, to find* U.

RULE. $w\times r-1=U.$

EXAMPLES.

50. If a freehold eſtate is bought for £1000. and the allowance of 5 per cent. is made to the buyer, what is the yearly rent? *Anſ.* 1,05—1=,05. *then* 1000×,05=£50.

51. If an eſtate be ſold for £3500. and 4 per cent. allowed to the buyer, what is the yearly rent? *Anſ.* £140.

52. If a freehold eſtate is bought for £1250. preſent money, and an allowane of 6 per cent. made to the buyer for the ſame, what is the yearly rent? *Anſ.* 75.

III. *When* W, U, *are given, to find* R.

RULE. $\frac{w+u}{w}=R.$

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EXAMPLES.

53. If an eſtate of £50. per annum be bough for £1000. what is the rate per cent.?

$$Anſ. \frac{1000+50}{1000}=1,05=5 \text{ per cent.}$$

54. If a freehold eſtate of £140. per annum be bought for £3500. what was the rate per cent. allowed? *Anſ.* 4 *per cent.*

55. If an eſtate of £75. per annum is ſold for £1250. what is the rate per cent. allowed? *Anſ.* 6 *per cent.*

Purchaſing FREEHOLD ESTATES *in* REVERSION.

To find the worth of a freehold eſtate in reverſion.

RULE. Find the worth of the yearly rent, *thus*, $\frac{u}{r-1}=W$. Change W into A, and find what principal being put to intereſt, will amount to A at the ſame rate, and for the time to come, before the eſtate commences, and that will be the worth of the eſtate in reverſion; *thus*, $\frac{a}{rt}=P$.

EXAMPLES.

56. If a freehold eſtate of £50. per annum, to commence 4 years hence, is to be ſold, what is it worth, allowing the purchaſer 5 per cent. for preſent payment?

$$Anſ. \frac{50}{1.05-1}=1000. \text{ then } \frac{1000}{1,2155}=£822..14..1..2 \text{ qrs.}+$$

57. What is an eſtate of £200. to continue for ever, but not to commence till the end of 2 years, worth in ready money, allowing the purchaſer 4 per cent.?

Anſ. £4622..15..7. ,44 *qrs.*

58. What is an eſtate of £240. per annum worth in ready money, to continue for ever, but not to commence till the end of 3 years, allowance being made at 6 per cent.?

Anſ. £3358..9..6. 2,24 *qrs.*

To find the yearly rent of an eſtate taken in reverſion.

RULE. Find the amount of the worth of the eſtate, at the given rate and time before it commences; *thus*, $wrt=A$.

Change A into W, and find what yearly rent being ſold will produce U, at the ſame rate; *thus*, $\frac{wr\times r-wr.}{r}=U$. which will be the yearly rent required.

EXAMPLES.

EXAMPLES.

59. If a freehold estate, to commence 4 years hence, is sold for £822..14..1..1,2 *qrs.* allowing the purchaser 5 per cent. what is the yearly income?

Anſ. 822,73625 × 1,2155 = 1000.

then 1000 × 1,05 × 1,05 — 1050.

$$\frac{1050}{10,05} = £50.$$

60. A freehold estate is bought for £4622..15..7.,44*d.* which does not commence till the end of 2 years, the buyer being allowed 4 per cent. for his money; I desire to know the yearly income? *Anſ.* £200.

61. There is a freehold estate sold for £3358..9..6. 2,24 *qrs.* but not to commence till the expiration of 3 years, allowing 6 per cent. for present payment; what is the yearly income? *Anſ.* £240.

REBATE *or* DISCOUNT.

A TABLE ſhewing the preſent worth of £1. due any number of years, to commence under 31, rebate at 5 and 6 *per cent.*

Years.	5 *Rates* 6		*Years.*	5 *Rates* 6	
1	,952381	,943396	16	,458111	,393647
2	,907030	,889996	17	,436296	,371364
3	,863838	,839619	18	,415520	,350343
4	,822702	,792093	19	,395734	,330513
5	,783526	,747258	20	,376889	,311804
6	,746215	,704960	21	,358942	,294155
7	,710682	,665057	22	,341849	,277505
8	,676839	,627412	23	,325571	,261797
9	,644609	,591898	24	,310067	,246978
10	,613913	,558394	25	,295302	,232998
11	,584679	,526787	26	,281240	,219810
12	,556837	,496969	27	,267848	,207368
13	,530321	,468839	28	,255093	,195630
14	,505068	,442301	29	,242946	,184556
15	,481017	,417265	30	,231377	,174110

Note. *The above Table is thus made:* 1 ÷ 1,05 = ,952381 *firſt year's preſent worth; and* ,952381 ÷ 1,05 = ,90703 *ſecond year; and* ,90703 ÷ 1,05 = ,863838 *third year, &c.*

L. *When*

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I. *When* S, T, R, *are given, to find* P.

RULE. $\frac{s}{rt} = P.$

EXAMPLES.

1. What is the present worth of £315..12..4. 2*d.* payable 4 years hence, at 6 per cent.?

Ans. 1,06×1,06×1,06×1,06=1,26247. *then*

	by the Table.
$\frac{315,6175}{1,26247} = £250$	315,6175
	,792093
	249,99841242 75

2. If £344..14..9. 1,92 *qrs.* be payable in 7 years time, what is the present worth, rebate being made at 5 per cent.?

Ans. 245.

3. There is a debt of £441..17..3. 1,92 *qrs.* which is payable 4 years hence, but it is agreed to be paid in present money; what sum must the creditor receive, rebate being made at 6 per cent.? *Ans.* £350.

II. *When* P, T, R, *are given, to find* S.

RULE. $p \times rt = S.$

EXAMPLES.

4. If a sum of money due 4 years hence produce £250. for the present payment, rebate being made at 6 per cent. what was the sum first due?

Ans. £250×1,26247=£315..12..4*d.* ,2*d.*

5. If £245. be received for a debt payable 7 years hence, and an allowance of 5 per cent. to the debtor for present payment, what was the debt? *Ans.* £344..14..9 1,92 *qrs.*

6. There is a sum of money due at the expiration of 4 years, but the creditor agrees to take £350. for present payment, allowing 6 per cent. what was the debt?

Ans. £441..17..3. 1,92 *qrs.*

III. *When* S, P, R, *are given, to find* T.

RULE. $\frac{s}{p} = rt$ *which being continually divided by* R, *till nothing remains, the number of those divisions will be equal to* T.

EXAMPLES.

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EXAMPLES.

7. The present payment of £250. is made for a debt of £315..12..4. ,2*d*. rebate at 6 per cent. in what time was the debt payable?

Ans. $\frac{315,6175}{250}=1,26247$ *which being continually divided, those divisions will be equal to* 4 *= the number of years.*

8. A person receives £245. now for a debt of £344..14..9. 1,92 *qrs.* rebate being made at 5 per cent. I demand in what time the debt was payable? *Ans.* 7 *years.*

9. There is a debt of £441..17..3. 1,92 *qrs.* due at a certain time to come, but 6 per cent. being allowed to the debtor for the present payment of £350. I desire to know in what time the sum should have been made without any rebate? *Ans.* 4 *years.*

IV. *When* S, P, T, *are given, to find* R.

RULE. $\frac{s}{p}=rt$ *which being extracted by the rules of extraction, (the time given in the question shewing the power) will be equal to* R.

EXAMPLES.

10. A debt of £315..12..4. ,2*d*. is due 4 years hence, but it is agreed to take £250. now, what is the rate per cent. that the rebate is made at?

Ans. $\frac{315,6175}{250}=1,26247$; $\sqrt[4]{1,26247}=1,06=6$ *per cent.*

11. The present worth of £344..14..9. 1,22 *qrs.* payable 7 years hence, is £245. at what rate per cent. is rebate made?

Ans. 5 *per cent.*

12. There is a debt of £441..17..3. 1,92 *qrs.* payable in 4 years time, but is agreed to take £350. present payment, I desire to know what rate per cent. rebate is made at?

Ans. 6 *per cent.*

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PART IV.

DUODECIMALS:

OR, WHAT IS GENERALLY CALLED,

Croſs Multiplication and Squaring of Dimenſions by ARTIFICERS *and* WORKMEN.

RULE *for Multiplying* DUODECIMALLY.

1. UNDER the Multiplicand write the correſponding denominations of the Multiplier.

2. Multiply each term in the Multiplicand (beginning at the loweſt) by the feet in the Multiplier; write each reſult under its reſpective term, obſerving to carry an unit for every 12, from each lower denomination to its next ſuperior.

3. In the ſame manner multiply the Multiplicand by the primes in the Multiplier, and write the reſult of each term one place more to the right hand of thoſe in the Multiplicand.

4. Work in the ſame manner with the ſeconds in the Multiplier, ſetting the reſult of each term two places to the right hand of thoſe in the Multiplicand, and ſo on for thirds, fourths, &c.

EXAMPLES.

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EXAMPLES.

	f. *in.*	*f.* *in.*		
1. Multiply	7 . 9	by 3 . 6		
Croſs Multiplication.	*Practice.*		*Duodecimals.*	*Decimals.*
7×9	6½ 7 . 9		7 . 9	7,75
3×6	3 . 6		3 . 6	3,5
21.-.-=7×3	23 . 3		23 . 3 ×3	3875
2.3.-=9×3	3 . 10.6		3 . 10.6×6	2325
3.6.-=7×6				
-.4.6=9×6	27 . 1 .6		27 . 1 . 6	27,125

27.1.6

	f. in.		*f. in.*		*f. in.*
2. Multiply	8.5.	by	4. 7.	*Facit*	38. 6.11.
3. Multiply	9.8.	by	7. 6.	*Facit*	72. 6.
4. Multiply	8.1.	by	3. 5.	*Facit*	27. 7. 5.
5. Multiply	7.6.	by	5. 9.	*Facit*	43. 1. 6.
6. Multiply	4.7.	by	3.10.	*Facit*	17. 6.10.
7. Multiply	7.5.9″	by	3. 5.3″	*Facit*	25. 8.6.2.3.
8. Multiply	10.4.5.	by	7. 8.6.	*Facit*	79.11.0.6.6.
9. Multiply	75.7	by	9. 8.	*Facit*	730. 7.8.
10. Multiply	97.8.	by	8. 9.	*Facit*	854. 7.
11. Multiply	57.9.	by	9. 5.	*Facit*	543. 9.9.
12. Multiply	75.9.	by	17. 7.	*Facit*	1331.11.3.
13. Multiply	87.5.	by	35. 8.	*Facit*	3117.10.4.
14. Multiply	179.3.	by	38.10.	*Facit*	6960.10.6.
15. Multiply	259.2.	by	48.11.	*Facit*	12677.6.10.
16. Multiply	257.9.	by	39.11.	*Facit*	10288.6.3.
17. Multiply	311.4.7.	by	36. 7.5.	*Facit*	11402.2.4.11.11.
18. Multiply	321.7.3.	by	9. 3.6.	*Facit*	2988.2.10.4.6.

The APPLICATION.

Artificer's work is computed by different meaſures, *viz.*

1. Glazing and maſon's flat-work by the foot.
2. Painting, plaiſtering, paving, &c. by the yard.
3. Partitioning, flooring, roofing, tyling, &c. by the ſquare of 100 feet.
4. Brickwork, &c. by the rod or 16 feet ½, whoſe ſquare is 272¼.

MEASURING

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MEASURING *by the* FOOT SQUARE, *as* GLAZIERS *and* MASON'S *Flatwork.*

EXAMPLES.

19. There is a houſe with 3 tier of windows, 3 in a tier, the height of the firſt tier 7 feet 10 inches, the ſecond 6 feet 8 inches, and the third 5 feet 4 inches, the breadth of each is 3 feet 11 inches, what will the glazing come to at 14*d.* per foot?

Duodecimals.

7 . 10 *the*
6 . 8 *heights*
5 . 4 *added*

19 . 10
3=*windows*

59 . 6 *in a tier.*
3 . 11 *in breadth.*

178 . 6
54 . 6 . 6

233 . — . 6

feet. in. pts.
233.—..6 *at* 14*d. per foot.*

2*d.*$\frac{1}{6}$233 = 1*s.*
38..10 = 2*d.*
$\frac{1}{2}$ = 6*parts.*

2|0)27|1..10$\frac{1}{2}$

£ 13..11..10$\frac{1}{2}$ *Anſ.*

20. What is the worth of 8 ſquares of glaſs, each meaſuring 4 feet 10 inches long, and 2 feet 11 inches broad, at 4*d.* $\frac{1}{3}$ per foot? *Anſ.* £1..18..9.

21. There are 8 windows to be glazed, each meaſures 1 foot 6 inches wide, and 3 feet in height, how much will they come to at 7*d.* $\frac{1}{2}$ per foot? *Anſ.* £1..3..3.

22. What is the price of a marble ſlab, whoſe length is 5 feet 7 inches, and the breath 1 foot 10 inches, at 6*s.* per foot? *Anſ.* £3..1..5.

MEASURING *by the* YARD SQUARE, *as* PAVIORS, PAINTERS, PLASTERERS, *and* JOINERS,

NOTE *Divide the ſquare feet by* 9, *and it will give the number of ſquare yards.*

EXAMPLES.

23. A room is to be ceiled, whoſe length is 74 feet 9 inches, and width 11 feet 6 inches, what will it come to at 3*s.* 10*d.* per yard. *Anſ.* £18..10..1.

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24. What will the paving of a court-yard come to, at 4*l*.¼ per yard, the length being 58 feet 6 inches, and breadth 54 feet 9 inches? *Anſ.* £7..—..10-

25. A room painted 97 feet 8 inches about, and 9 feet 10 inches high, what does it come to at 2*s*. 8*d*.,¼ per yard? *Anſ.* £14..11..1.

26. What is the content of a piece of wainſcotting in yards ſquare, that is 8 feet 3 inches long, and 6 feet 6 inches broad, and what will it come to at 6*s*. 7*d*.½ per yard? *Anſ.* £1..19..5.

27. What will the paving a court-yard come to, at 3*s*. 2*d*. per yard, if the length be 27 feet 10 inches, and the breadth 14 feet 9 inches? *Anſ.* £7..4..5.

28. A perſon has paved a court-yard 42 feet 9 inches in front, and 68 feet 6 inches in depth, and in this he laid a foot-way the depth of the court, of 5 feet 6 inches in breadth: the foot-way is laid with Purbeck ſtone, at 3*s*. 6*d*. per yard, and the reſt with pebbles, at 3*s*. per yard, what will the whole come to? *Anſ.* £49..17..—.

29. What will the plaiſtering a ceiling, at 10*d*. per yard, come to, ſuppoſing the length 21 feet 8 inches, and the breadth 14 feet 10 inches? *Anſ.* £1..9..9.

30. What will the wainſcotting a room come to, at 6*s*. per ſquare yard, ſuppoſing the height of the room (taking in the cornice and moulding) is 12 feet 6 inches, and the compaſs 83 feet 3 inches, the three window ſhutters each 7 feet 8 inches, by 3 feet 6 inches, and the door 7 feet by 3 feet 6 inches; the ſhutters and door being worked on both ſides, is reckoned work and half work. *Anſ.* £36..12..2½

MEASURING *by the* SQUARE *of* 100 *feet, as* FLOORING, PARTITIONING, ROOFING, TYLING, *&c.*

EXAMPLES.

31. In 173 feet 10 inches in length, and 10 feet 7 inches in height of partitioning, how many ſquares?
Anſ. 18 *ſquares*, 39 *feet*, 8 *inches*, 10 *p*.

32. If a houſe of 3 ſtories, beſides the ground floor, was to be floored at £6..10..—. per ſquare, and the houſe meaſured 20 feet 8 inches, by 16 feet 9 inches: there are 7 fire places, whoſe meaſures are two of 6 feet, by 4 feet 6 inches each, two of 6 feet by 5 feet 4 inches each, and two of 5 feet 8 inches, by 4 feet 8 inches, and the ſeventh of 5 feet 2 inches, by 4 feet, and the well-hole for the

ſtairs

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ſtairs is 10 feet 6 inches, by 8 feet 9 inches, what will the whole come to? *Anſ.* £53..13..3¼.

33. If a houſe meaſures within the walls 52 feet 8 inches in length, and 30 feet 6 inches in breadth, and the roof be of a true pitch, what will it come to roofing at 10*s.* 6*d.* per ſquare? *Anſ.* £12..12..11¾

Note. *In tyling, roofing, and ſlating, it is cuſtomary to reckon the flat, and half of any building within the wall, to be the meaſure of the roof of that building, when the ſaid roof is of a true pitch,* i. e. *when the rafters are ¾ of the breadth of the building; but if the roof is more or leſs than the true pitch, they meaſure from one ſide to the other, with a rod or ſtring.*

34. What will the tyling of a barn coſt, at 25*s.* 6*d.* per ſquare, the length being 43 feet 10 inches, and breadth 27 feet 5 inches on the flat, the eave boards projecting 16 inches on each ſide? *Anſ.* 24..9..5½.

MEASURING *by the* ROD.

Note. *Bricklayers always value their work at the rate of a brick and a half thick; and if the thickneſs of the wall is more or leſs, it muſt be reduced to that thickneſs by this*

RULE. Multiply the area of the wall by the number of half bricks the thickneſs of the wall is of; the product, divided by 3, gives the area.

EXAMPLES.

35. If the area of a wall be 4085 feet, and the thickneſs two bricks and a half, how many rods doth it contain?

Anſ. 25 *rods.*

36. If a garden wall be 254 feet round, and 12 feet 7 inches high, and 3 bricks thick, how many rods doth it contain? *Anſ.* 23 *rods*, 136 *feet.*

37. How many ſquare rods are there in a wall 62½ feet long, 14 feet 8 inches high, and 2½ bricks thick?

Anſ. 5 *rods*, 167 *feet.*

38. If the ſide walls of a houſe be 28 feet 10 inches in length, and the height of the roof from the ground 53 feet 8 inches, and the gable (or triangular part at top) to riſe 42 courſe of bricks, reckoning 4 courſe to a foot. Now, 20 feet high is 2½ bricks thick, 20 feet more, at 2 bricks thick, 15 feet 8 inches more, at 1½ brick thick, and the gable at 1 brick thick, what will the whole work come to, at £5..16..—. per rod? *Anſ.* £48..13..5½.

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Multiplying several figures by several, and the product to be produced in one line only.

Rule. Multiply the units of the multiplicand by the units of the multiplier, setting down the units of the product, and carry the tens; next multiply the tens in the multiplicand by the units of the multiplier, to which add the product of the units of the multiplicand multiplied by the tens in the multiplier, and the tens carried; then multiply the hundreds in the multiplicand by the units of the multiplier, adding the product of the tens in the multiplicand multiplied by the tens in the multiplier, and the units of the multiplicand by the hundreds in the multiplier; and so proceed till you have multiplied the multiplicand all through, by every figure in the multiplier.

Examples.

Multiply —	35234	35234
by —	52424	52424
	1847107216	140936
		70468
		140936
		70468
		176170
		1847107216

Explanation.

First, $4\times4=16$, that is 6 and carry 1. *Secondly*, $3\times4+4\times2$, and 1 that is carried is 21, set down 1 and carry 2. *Thirdly*, $2\times4+3\times2+4\times4+2$ carried $=32$; that is, 2 and carry 3. *Fourthly*, $5\times4+2\times2+3\times4+4\times2+3$ carried$=47$; set down 7 and carry 4. *Fifthly*, $3\times4+5\times2+2\times4+3\times2+4\times5+4$ carried $=60$; set down 0 and carry 6. *Sixthly*, $3\times2+5\times4+2\times2+3\times5+6$ carried $=51$; set down 1 and carry 5. *Seventhly*, $3\times4+5\times2+2\times5+5$ carried $=37$, that is 7 and carry 3. *Eighthly*, $3\times2+5\times5+3$ carried $=34$; set down 4 and carry 3. *Lastly*, $3\times5+3$ carried $=18$; which being multiplied by the last figure in the multiplier, set the whole down, and the work is finished.

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PART V.

The Menſuration of Circles, &c.

A Circle is a plain figure, contained under one line, which is called a circumference, unto which all lines drawn from a point in the middle of the figure, called the centre, and falling upon the circumference, are equal the one to the other. The circle contains more ſpace than any plain figure of equal compaſs.

Problem 1. *The diameter of a circle being given to find the circumference; or the circumference being given, to find the diameter.*

Rule 1. As 7 is to 22, ſo is the diameter to the circumference. Or, as 22 is to 7, ſo is the circumference to the diameter.

Examples.

1. If the diameter of a circle be 7, what is the circumference? As 7 : 22 :: 7

7

7) 154

Anſ. 22 *per rule.*

2. If the circumference of a circle be 22, what is the diameter? As 22 : 7 :: 22

7

22) 154(7 *Anſ.*
154

...

3. If

3. If the diameter of a circle be 4, what is the circumference? *Anſ.* 12,75 *the circumference.*

4. If the circumference of a circle be 12,57, what is the diameter? *Anſ.* 3,999=4, *nearly the diam.*

RULE 2. As 113 is to 355, ſo is the diameter to the circumference. Or, as 355 is to 113, ſo is the circumference to the diameter.

1. If the diameter of a circle be 5 feet, what is the circumference?

As 113 : 355 :: 5
5

113)1775(15,7 *feet, the circumference.*
113

645
565

800
791

9

2. What is the diameter of that circle, whoſe circumference is 15,7?

As 355 : 113 :: 15,7
15,7

791
565
113

355)1774,1(4,99(=5, *nearly the diam.*
1420

3541
3195

3460
3195

265

RULE

RULE 3. Multiply the diameter by 3,1416, and the product will be the circumference. Or, divide the circumference by 3,1416, and the quotient will be the diameter.

EXAMPLES.

1. If the diameter of a circle be 10, what is the circumference?

3,1416
10

Anſ. 31,416 = *the circumference.*

2. If the circumference of a circle be 31,416, what is the diameter? 3,1416)31,4160(10 = *the diameter.*
31416

.....0

3. If the diameter of a circle be 100 inches, what is the circumference? *Anſ.* 314,16 *the circumference.*

4. The circumference of the earth is known to be 25020 miles, what is the diameter? *Anſ.* 7964 *Miles, the diam.*

Problem 9. *To find the area of a circle.*

RULES.

1. Multiply half the circumference by half the diameter, and the product will be the area.
2. Multiply the ſquare of the diameter by ,7854, the product will be the area.
3. Multiply the ſquare of the circumference by ,079574, the product is the area.
4. Multiply the ſquare of the ſemi-diameter by 3,1416, the product will be the area.
5. Multiply the circumference by the diameter, and a fourth part of the product will be the area.

Note. ,7854, and 3,1416, are areas of circles, whoſe diameters are 1 and 2, and ,079577, is the area of a circle, whoſe circumference is 1, likewiſe 432, and 1,273939, are ſquares

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ſquares of the diameters of circles, whoſe areas are 355, and 1, and 1,12831 is the diameter of a circle, whoſe area is equal to a ſquare, whoſe ſide is 1.

EXAMPLES.

1. What is the area of a circle, whoſe diameter is 100 inches, and circumference 314,16?

By rule 2, 100
100

10000
,7854

Anſ. 7854 *area.*

Or thus, by rule 4, 50×50=2500. Then 3,1416×2500=7854, the area, as before.

By rule 1, 2)314,16

15708 = *Half circumference*
50 = *Half diameter*

Anſ. 7854,00 *Area, as before.*

2. What is the area of a circle, whoſe diameter is 17, and circumference 53,4072 inches?

By rule 1, 2)53,4072

26,7036 = *Half circumference*
8,5 = *Half diameter*

1335180
2136288

Anſ. 226,98060 *inches.*

3. What is the area of a circle whoſe diameter is 3 feet?

By rule 4, ,7854
9 = *ſquare of the diameter*

Anſ. 7,0686=7 *feet*, 0 *inches*, 9 *parts.*

4. If

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4. If the diameter of a circle be 4 inches, what is the area?

By rule 2, ,7854
16 = *ſquare of the diameter*

Anſ. 12,5664 *inches.*

5. What is the area of a circle, whoſe diameter is 4, and circumference 12,5664 inches?

By rule 1, 2)12,5664

6,2832 = *Half the circumference.*
2

Anſ. 12,5664 *inches, the area.*

Note. In this example it may be obſerved, that when the diameter is 4, the circumference and area are equal.

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PART VI.

A Collection of QUESTIONS *set down promiſcuouſly, for the greater Trial of the foregoing* RULES.

1. WRITE down two millions, five hundred and two thouſand, two hundred and five.

2. What is the value of 14 barrels of ſoap, at 4*d*.½ per lb. each barrel containing 254lb? *Anſ.* £66..13..6.

3. If £100. principal gain £5. intereſt in 12 months, what principal will gain £20. in 8 months? *Anſ.* £600.

4. What number is that from which, if the ſquare of 14 be deducted, and to the remainder the ſquare of 12 be added, the ſum will be 250.? *Anſ.* 302.

5. A and B trade together; A put in £320. for 5 months, B £460. for 3 months, and they gained £100. what muſt each man receive? *Anſ.* A £53..13 .9 $\frac{17}{29}\frac{0}{8}$.
and B £46.. 6..2 $\frac{7}{29}\frac{8}{8}$.

6. How many yards of cloth at 17*s*. 6*d*. per yard, can I have for 13 cwt. 2 qrs. of wool, at 14*d*. per lb.?
Anſ. 100*yards* 3 *qrs*. $\frac{1}{5}$

7. What number added to the cube of 21, will make the ſum equal to 113 times 147? *Anſ.* 7350

8. If I buy 1000 ells of Flemiſh linen for £90. what may I ſell it per ell in London, to gain £10. by the whole?
Anſ. 3*s*. 4*d*. *per ell.*

9. A has 648 yards of cloth, at 14*s*. per yard, ready money, but in barter will have 16*s*. B has wine at £42. per tun, ready money; the queſtion is, how much wine muſt be given for the cloth, and what is the price of a tun of wine in barter? *Anſ.* £48. *the tun, and* 10 *tun*, 3 *hhds*. 12. *gal. of wine muſt be given for the cloth.*

10. A jeweller ſold jewels to the value of £1200. for which he received in part 876 French piſtoles, at 16*s*. 6*d*. each, what ſum remains unpaid? *Anſ.* £447..6..–.

11. An

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11. An oilman bought 417 cwt. 1 qr. 15 lb. gross weight of train oil, tare 20lb. per 112 lb. how many neat gallons were there, allowing 7½ lb. to a gallon? *Ans.* 5120 *gallons.*

12. I bought threescore pieces of Holland for three times as many pounds, and sold them again for four times as much: but if they had cost me as much as I sold them for, what should I have sold them for to gain after the same rate?
Ans. £320.

13. What number taken from the square of 54 will leave 19 times 46? *Ans.* 2042.

14. If I buy a yard of cloth for 14*s.* 6*d.* and sell it for 16*s.* 9*d.* what do I gain per cent? *Ans.* £15..10..4 $\frac{24}{174}$.

15. Bought 27 bags of ginger, each weighing gross 84lb. ¼, tare 1lb. ⅜ per bag, trett 4lb. per 104lb. what do they come to at 8*d*½. per lb.? *Ans.* £76..13..3½.

16. If ⅔ of an ounce cost ⅞ of a shilling, what will ⅝ of a lb cost? *Ans.* 17*s.* 6*d.*

17. If ⅝ of a gallon cost ⅝ of a £. what will ⅔ of a tun cost? *Ans.* £105.

18. A young man received £210. which was ⅔ of his elder brother's portion; now three times the eldest brother's portion was half of the father's estate, I demand how much the estate was? *Ans.* £1890.

19. If the salary of an officer be £48. per annum, what must he receive for 232 days? *Ans.* £30..10..2¼.

20. A gentleman spends one day with another £1..7..10½. and at the year's end layeth up £340. what is his yearly income? *Ans.* £848..14..4½.

21. A lady's fortune consisted of a cabinet, worth £200. containing 16 drawers, each having two partitions, each of which contained £37. and 2 crowns, pray what was her portion? *Ans.* £1400.

22. A has 13 fother of lead to send abroad, each being 19½ times 112lb. B has 39 casks of tin, each 388lb. how many ounces difference is there in the weight of these commodities? *Ans.* 212160 *oz.*

23. A captain and 160 sailors took a prize worth £1360. of which the captain had ⅛ for his share, and the rest was equally divided among the sailors, what was each man's part?
Ans. The captain had £272. *ane each sailor* £6..16..--.

24. What number is that, to which if you add 7⅔, the whole will be 12¼. *Ans.* $4\frac{7}{12}$.

25. An usurer put out £75. for 12 months, and received for principal and interest £81. I demand at what rate per cent he received interest? *Ans.* 8 *per cent.*

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26. What will £956. amount to in 7½ years, at 5 per cent. simple interest? *Ans.* £1314..10..-.

27. At what rate per cent. will £956. amount to £1314. 10s, in 7½ years, at simple interest? *Ans.* 5 *per cent.*

28. If for £1..4..-. I have 1200lb. weight carried 36 miles, how many lb. weight can I have carried 24 miles for the same money? *Ans.* 1800 *lb.*

29. If 8 cannons in one day spend 48 barrels of powder, I demand how many barrels 24 cannons will spend in 22 days? *Ans.* 3168.

30. What number is that, which being multiplied by $\frac{2}{3}$, will produce $\frac{1}{4}$? *Ans.* $\frac{3}{8}$.

31. A hath 24 cows worth 72s. each, and B 7 horses worth £13. a piece, how much will make good the difference, in case they interchange their said drove of cattle?

Ans. £4..12..-.

32. A man dies and leaves £120. to be given to three persons, *viz.* A, B, and C; to A share unknown; B twice as much as A, and C as much as A and B; what was the share of each? *Ans.* A £40, *and* B £40, *and* C £60.

33. A person dying, left his widow £1780. and £1250. to each of his four children; he had been 25½ years in trade, and had cleared (at an average) £126. a year, what had he to begin with? *Ans.* £3567.

34. There is a sum of £1000. to be divided among 3 men, in such manner that if A has £3. B shall have £5. and C £8. how much must each man have?

Ans. A £187..10..-. B £312..10..-. *and* C £500.

35. A piece of wainscot is 8 feet 6 inches and ½ long, and 2 feet 9 inches ½ broad, what is the superficial content?

Ans. 24 *feet* 0..3 ..4..6.

36. How many changes may be rung on 6 bells? *Ans.* 720.

37. A merchant at Amsterdam is indebted to another in London £642. and would pay it in Spanish guilders, at 2s. per piece, how many must the English merchant receive?

Ans. 6420.

38. If 360 men be in garrison, and have provision for 6 months, but hearing of no relief at the end of five months, how many men must depart, that the provisions may last so much the longer? *Ans.* 288 *men.*

39. The less of two numbers is 187, their difference 34, the square of the product is required? *Ans.* 1707920929.

40. A butcher sends his man with £216. to a fair to buy cattle; oxen at £11. cows at 40s. colts at £1..5..-. and hogs

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hogs at £1..15..–. per piece, and of each a like number, how many of each sort did he buy?

Anſ. 13 *of each ſort, and* 8 *over.*

41. What number added to $11\frac{5}{7}$, will produce $36\frac{337}{6}$?

Anſ. $24\frac{5}{6}\frac{13}{6}$.

42. What number multiplied by $\frac{3}{7}$ will produce $11\frac{9}{17}$?

Anſ. $26\frac{46}{51}$.

43. A man had 12 ſons; the youngeſt was three years old, and the eldeſt 58; they increaſed in arithmetical progreſſion, what was the common difference of their ages?

Anſ. 5 *years.*

44. What is the value of 179 hogſheads of tobacco, each weighing 13 cwt. at £2..7..1. per cwt.? *Anſ.* £5478..2..11.

45. My factor ſends me word he has bought goods to the value of £500..13..6. upon my account, what will his commiſſion come to at $3\frac{1}{2}$ per cent.? *Anſ.* 17..10..5. 2 *qrs.* $\frac{68}{100}$.

46. Miſs Kitty told her ſiſter Charlotte, whoſe father had before left them £13200. a-piece, that their grandmother by will had raiſed her fortune to 15000. and had made her own £20000. what did the old lady leave them? *Anſ.* £8600.

47. A ſnail, in getting up a may-pole only 20 feet high, was obſerved to climb 8 feet every day, but every night he came down again 4 feet; in what time by this method did he reach the top of the pole? *Anſ.* 4 *days.*

48. If the $\frac{1}{3}$ of 6 be 3, what will $\frac{1}{4}$ of 20 be? *Anſ.* $7\frac{1}{2}$.

49. What is the difference between 14676, and the fourth of itſelf? *Anſ.* 11007.

50. There is in three bags the ſum of £1468. viz. in the firſt bag £461. in the ſecond £581. what was in the third bag? *Anſ.* £426.

51. What is the decimal of 3 qrs. 14 lb. of an cwt.? *Anſ.* 875.

52. How many lb. of ſugar, at $4d$ $\frac{1}{2}$ per lb. muſt be given in barter for 60 groſs of incle, at 8*s.* 8*d.* per groſs?

Anſ. $1380\frac{2}{3}$.

53. If I buy yarn for 9*d.* the lb. and ſell it again for $13d\frac{1}{2}$. per lb. what is the gain per cent.? *Anſ.* £50.

54. A tobacconiſt would mix 20 lb. of tobacco, at 9*d.* per lb. with 60 lb. at 12*d.* per lb. 40 lb. at 18*d.* per. lb. and with 12 lb. at 2*s.* per lb. what is a lb. of this mixture worth?

Anſ. 1*s.* 2*d.* $\frac{1}{4}$ $\frac{9}{11}$.

55. What is the value of 14 barrels of ſoap, at $4d\frac{1}{2}$. per lb. each barrel containing 254 lb.? *Anſ.* £66..13..6.

56. Two perſons, A and B, owe ſeveral debts; the leſſer debt being that of A, is £2173. the difference is £371. what is the debt of B?

 Anſ. £2544.

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57. What is the difference between twice eight and twenty and twice twenty-eight: as alſo between twice five and fifty and twice fifty-five. *Anſ.* 20 *and* 50.

58. What number taken from the ſquare of 54 will leave 19 times 46? *Anſ.* 2042.

59. A ſchoolmaſter being aſked how many ſcholars he had, ſaid, if I had as many more, half as many, and 1 quarter as many, I ſhould have 99, how many had he? *Anſ.* 36.

60. An ancient lady being aſked how old ſhe was, to avoid a direct anſwer, ſaid, I have 9 children, and there are 3 years between the birth of each of them; the eldeſt was born when I was 19 years old, which is now exactly the age of the youngeſt; how old was the lady? *Anſ.* 62.

61. What number is that which being added to 168 makes the ſum to be 706? *Anſ.* 538.

62. From £100. borrowed, take £72. paid;
'Twas a virgin that lent it, what's due to the maid? *Anſ.* £28.

63. If when wheat is 4*s.* the buſhel, the 20 penny loaf weighs 18 lb. what muſt the ſaid 20 penny loaf weigh, when wheat is 6*s.* the buſhel? *Anſ.* 12 lb.

64. Whereas a noble and a mark juſt 15 yards did buy;
How many ells of the ſame cloth for £50. had I? *Anſ.* 600.

65. A broker bought for his principal in the year 1720, £400. capital ſtock in the South Sea, at £650. per cent. and ſold it again when it was worth but £130. per cent. how much was loſt in the whole? *Anſ.* £2080.

66. What number added to the 43d part of 4429, will make the ſum 240? *Anſ.* 137.

67. What number deducted from the 26th part of 2262, will leave the 87th part of the ſame? *Anſ.* 61.

68. A gentleman went to ſea at 17 years of age; 8 years after that he had a ſon born, who lived 46 years, and died before his father; after whom the father lived twice 20 years, and then died alſo; what was the age of the father when he died? *Anſ.* 111.

69. C hath candles at 6*s.* per dozen ready money, but in barter will have 6*s.* 6*d.* per dozen; D hath cotton at 9*d.* per lb. ready money; I demand what price the cotton muſt be at in barter; alſo how much cotton muſt be bartered for 100 dozen of candles? *Anſ. The cotton at* 9*d.* 3 *qrs. per lb. and* 7 *cwt.* 16 *lb. of cotton muſt be given for* 100 *dozen of candles.*

70. The ſum of two numbers is 360, the leſs 114, what is their difference, product, and larger quota?
Anſ. 132 *diff.* 28044 *prod.* 2 $\frac{1}{19}$.

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71. A brigade of horſe, conſiſting of 384 men, is to be formed into a ſquare body, having 32 men in front, how many ranks will there be? *Anſ.* 12.

72. If a clerk's ſalary be £73. a year, what is that per day? *Anſ.* 4*s.*

73. B hath an eſtate of £53. per annum, and payeth 5*s.* 10*d.* to the ſubſidy, what muſt C pay, whoſe eſtate is worth £100. per annum? *Anſ.* 11*s.* 0*d.* $\frac{4}{53}$.

74. If I buy 100 yards of ribbon, at 3 yards for a ſhilling, and 100 more at 2 yards for a ſhilling, and ſell it at the rate of 5 yards for 2 ſhillings, whether do I get or loſe, and how much? *Anſ. loſe* 3*s.* 4*d.*

75. What is the value of $\frac{5}{8}$ of 20*s.* *Anſ.* 12*s.* 6*d.*

76. What number is that, from which if you take $\frac{3}{5}$, the remainder will be $\frac{1}{8}$? *Anſ.* $\frac{29}{40}$.

77 My purſe and money, quoth Dick, are worth 12*s.* 8*d.* but the money is worth 7 of the purſe, pray what is the ſum therein? *Anſ.* 11*s.* 1*d.*

78. What number is that which maketh 9 to be the $\frac{2}{3}$ of it? *Anſ.* $13\frac{1}{2}$.

79. A maltſter has ſeveral ſorts of malt, one at 4*s.* 6*d.* another at 4*s.* and a third at 3*s.* 6*d.* a buſhel; to mix an equal quantity of each, what muſt be the price of a buſhel? *Anſ.* 4*s.*

80. A farmer is willing to make a mixture of rye at 4*s.* a buſhel, barley at 3*s.* and oats at 2*s.* how much muſt he take of each to ſell it at 2*s.* 6*d.* the buſhel?

Anſ. 6 *of rye,* 6 *of barley, and* 24 *of oats.*

81. If $\frac{3}{8}$ of a ſhip be worth £3740. what is the worth of the whole? *Anſ.* £9973..6 .8.

82. A perſon ſaid he had 20 children, and that it happened there was a year and a half between each of their ages; his eldeſt ſon was born when he was 24 years old, and the age of his youngeſt is 21, what was the father's age? *Anſ.* $73\frac{1}{2}$ *years.*

83. Bought a caſk of wine for £62..8..–. how many gallons were in the ſame, when a gallon was valued at 5*s.* 4*d.*?

Anſ. 234.

84. B owes C £269..17..–. but he compounds for 7*s.* 6*d.* in the pound, what muſt C receive for his debt?

Anſ. 111..6..$4\frac{1}{2}$.

85. How many dozen of ſtockings, at 11 groats per pair, may I buy for £190..12..–? *An.* 86 *doz.* 7 *pair* $\frac{28}{44}$.

86. A ſheepfold was robbed 3 nights ſucceſſively; the firſt night half the ſheep were ſtolen, and half a ſheep more;

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the second night half the remainder were loft, and half a ſheep more; the laſt night they took half that were left, and half a ſheep more; by which time they were reduced to 20; how many were they at firſt? *Anſ.* 167.

87. The Spectator's club of fat people, though it conſiſted but of 15 perſons, is ſaid to weigh no leſs than 3 tons, how much at an equality was that per man? *Anſ.* 4 *cwt.*

88. A merry young fellow in a ſmall time got the better of $\frac{1}{3}$ of his fortune; by advice of his friends, he gave £2200. for an Exempt's place in the guards; his profuſion continued till he had no more than 880 guineas left, which he found by computation was $\frac{3}{20}$ part of his money after the commiſſion was bought; pray what was his fortune at firſt?

Anſ. £10450.

89. B owes C £395..18..–. but compounds the whole debt for £100..12..–. what is that in the pound?

Anſ. 5..0*d.* $\frac{3}{4}$ $\frac{7}{79}$ $\frac{44}{1}$ $\frac{6}{8}$.

90. How many dollars at 4*s.* 4*d.* each, muſt be given for 360 guilders, at 2*s.* 2*d.* each? *Anſ.* 180.

91. Four men have a ſum of money to be divided amongſt them in ſuch a manner, that the firſt ſhall have $\frac{1}{3}$ of it, the ſecond $\frac{1}{4}$, the third $\frac{1}{6}$, and the fourth the remainder, which is 28, what is the ſum? *Anſ.* 112.

92. What is the amount of £1000. for 5 years $\frac{1}{2}$, at $4\frac{1}{2}$ per cent. ſimple intereſt? *Anſ.* £1261..5..–.

93. Sold goods amounting to the value of £700. for two 4 months, what is the preſent worth, at 5 per cent. ſimple intereſt? *Anſ.* £682..10..–.

94. A room 30 feet long, and 18 feet wide, is to be covered with painted cloth, how many yards of $\frac{3}{4}$ wide will cover it? *Anſ.* 80 *yards.*

95. There are two numbers, the one 48, the other twice as much, what is the difference between their ſum and difference? *Anſ.* 96.

96. Hetty told her brother George, that though her fortune on her marriage took £19312. out of her family, it was but $\frac{3}{5}$ of 2 years rent. Heaven be praiſed! of his yearly income, pray what was that? *Anſ.* £16093..6..8. *a year.*

97. There are two numbers, the one 25, the other the ſquare of 25, I demand the ſquare root of the ſum of their ſquares? *Anſ.* 625,4998.

98. Says B to C, if I had 4 of your ſheep, I ſhould have as many as you; and ſays C to B, if I had 4 of yours, I ſhould have twice as many as you; how many had each?

Anſ. B 20, C 28.

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99. B, C, and D, trading together gained £120. which is to be ſhared according to each man's ſtock; B put in £140. C £300. and D £160. what is each man's ſhare?

Anſ. B £28. C £60. D £32.

100. A gentleman having 50s. to pay among his labourers for a day's work, would give to every boy 6*d.* to every woman 8*d.* and to every man 16*d.* the number of boys, women and men was the ſame, I demand the number of each?

Anſ. 20 *of each.*

101. There are 3 numbers, 17, 19, and 48, I demand the difference between the ſum of the ſquares of the firſt and laſt, and the cube of the middlemoſt? *Anſ.* 4266.

102 A ſtone that meaſures 4 feet 6 inches long, 2 feet 9 inches broad, and 3 feet 4 inches deep, how many ſolid feet doth it contain? *Anſ.* 41 *feet* 3 *inches.*

103. What does the whole pay of a man of war's crew of 640 ſailors amount to for 32 months ſervice, each man's pay being 22s. 6*d.* per month? *Anſ.* £23040.

104. If I have an eſtate of £470. per annum, what may I expend daily, and yet lay up £130. per annum?

Anſ. 18s. 7*d.* $\frac{1}{2}\frac{9}{3}\frac{0}{6}\frac{0}{5}$.

105. What number is that, which being divided by 19, the quotient will be 72? *Anſ.* 1368.

106. Reduce 13 $\frac{1}{2}$ buſhels of coals to the fraction of a chaldron. *Facit* $\frac{3}{8}$.

107. Bought 28 qrs. 2 buſhels of wheat at 4s. 6*d.* per buſhel, what does it come to? *Anſ.* £50..17..-.

108. How many pounds of coffee, at 5s. 9*d.* per lb. is equal in value to 426 lb. of tea, at 13s. 4*d.* per lb.?

Anſ. £987 $\frac{57}{9}$.

109. What is the value of 27 dozen, 10 lb. of candles, at 5*d.* per lb? *Anſ.* £6..19..2.

110. A traveller would change 500 French crowns at 4s. 6*d.* per crown, into ſterling money, but he muſt pay a halfpenny per crown for change, how much muſt he receive?

Anſ. £111..9..2.

111. There are two numbers, the one 63, and the other $\frac{1}{3}$ as much, I demand the product of their ſquares, and the difference of their product and ſum?

Anſ. Product of their ſquares 3938240, 25. *difference* 1890.

112. B and C traded together, and gained £100.; B put in £640.; C put in ſo much that he might receive £60. of the gain, I demand how much C put in? *Anſ.* £960.

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113. Of what principal sum did £20. interest arise in one year, at the rate of 5 per cent. per annum? *Ans.* £400.

114. Having bought 40 yards of cloth, at 8*s.* per yard, and 79 yards at 12*s.* what is the value of both pieces? *Ans.* £58.

115. Two men depart both from one place, the one goes North, the other South; the one goes 7 miles, and the other 11 miles a day, how far are they distant at the 12th day of their departure? *Ans.* 216 *miles.*

116. In 672 Spanish guilders of 2*s.* each, how many French pistoles, at 17*s.* 6*d.* per piece? *Ans.* 76 $\frac{28}{35}$.

117. In 7 cheeses, each weighing 1 cwt. 2 qrs. 5 lb. how many allowances for seamen may be cut, each weighing 5 oz. 7 drams? *Ans.* 356$\frac{35}{87}$.

118. If 48 taken from 120 leaves 72, and 72 taken from 91 leaves 19, and 7 taken from thence leaves 12, what number is that, out of which, when you have taken 48, 72, 19, and 7, leaves 12? *Ans.* 158.

119. A farmer, ignorant of numbers, ordered £500. to be divided among his five sons, thus: give A, says he $\frac{1}{3}$, B $\frac{1}{4}$, C $\frac{1}{5}$, D $\frac{1}{6}$, E $\frac{1}{7}$ part; divide this equitably among them, according to the father's intention.

Ans. A £152$\frac{139}{274}$, B £114$\frac{101}{274}$, C £91$\frac{138}{274}$, D £76$\frac{69}{274}$, E £65$\frac{95}{274}$.

120. When first the marriage knot was ty'd
Between my wife and me,
Her age did mine as far exceed,
As three times three does three:
But when seven years, and half seven years,
We man and wife had been,
My age came then as near to her's,
As eight is to sixteen.

Quest. What was each of our ages when we married?
Ans. 10$\frac{1}{2}$ *years the man*, 31$\frac{1}{2}$ *the woman.*

121. If 12 oxen will eat 3$\frac{1}{3}$ acres of grass in four weeks, and 21 oxen will eat 10 acres in 9 weeks, how many oxen will eat 24 acres in 18 weeks, the grass being allowed to grow uniformly? *Ans.* 36.

122. A lady was asked her age, who replied thus:
My age if multiplied by three,
Two sevenths of that product tripled be,
The square root of two ninths of that is four;
Now tell my age, or never see me more?
Ans. 28 *years.*

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A TABLE for finding the INTEREST of any ſum of Money for any number of months, weeks, or days, at any rate PER CENT.

Year.	Calen. Mon.	Week.	Day.
£.	£. s. d.	£. s. d.	£. s. d.
1	.—.. 1..8	.—.—.. 4½	—.—.—½
2	.—. 3..4	.—.—.. 9	—.—.. 1¼
3	.—.. 5..—	.—.. 1.. 1½	—.—.. 2
4	.—.. 6..8	.—.. 1.. 6½	—.—.. 2½
5	.—.. 8..4	.—.. 1.. 11	—.—.. 3¼
6	.—..10..—	.—.. 2.. 3¾	—.—.. 4
7	.—..11..8	.—.. 2.. 8½	—.—.. 4½
8	.—..13..4	.—.. 3.. 1	—.—.. 5¼
9	.—..15..—	.—.. 3.. 5½	—.—.. 6
10	.—..16..8	.—.. 3..10¼	—.—.. 6½
20	.. 1..13..4	.—.. 7.. 8½	—. 1.. 1¼
30	.. 2..10..—	.—.. 11..6½	—.. 1.. 7¾
40	.. 3.. 6..8	.—.. 15..4½	—.. 2.. 2¼
50	.. 4.. 3..4	.—.. 19..2¾	—.. 2.. 9
60	.. 5..—..—	.. 1.. 3.. ¾	—.. 3.. 3½
70	.. 5..16..8	.. 1.. 6..11	—.. 3..10
80	.. 6..13..4	.. 1.. 10..9¼	—.. 4.. 4½
90	.. 7..10..—	.. 1.. 14..7½	—.. 4..11¼
100	.. 8.. 6..8	.. 1.. 18..5½	—.. 5.. 5¾
200	..16..13..4	.. 3..16..11	—.. 10..11½
300	..25..—..—	.. 5..15.. 4½	—.. 16.. 5¼
400	..33.. 6..8	.. 7..13..10	1.. 1..11
500	..4..13..4	.. 9..12.. 3½	1.. 7.. 4¾
600	..50..—..—	.. 11..10..9	1..12..10½
700	..58.. 6..8	.. 13..9.. 2¾	1..18.. 4¼
800	..66..13..4	.. 15..7.. 8½	2.. 3..10
900	..75..—..—	.. 17..6.. 1¾	2.. 9.. 3¾
1000	..83.. 6..8	.. 19.. 4.. 7¼	2..14.. 9½
2000	.166..13..4	.. 38..9.. 2¾	5.. 9.. 7
3000	.250..—..—	..57..13..10	8.. 4.. 4½
4000	.333.. 6..8	.76..18.. 5½	10..19.. 2
5000	.416..13..4	..96.. 3..—	11..13..11½
6000	.500..—..—	.115.. 7.. 8¼	16.. 8.. 9
7000	.583.. 6..8	.134..12.. 3¾	19.. 3.. 6½
8000	.666..13..4	.153..16..11	21..18.. 4¼
9000	.750..—..—	.173.. 1.. 6½	24..3.. 1¾
10,000	.833.. 6..8	.192.. 6.. 1¾	27.. 7..11¼
20,000	1666..13..4	..384..12..3½	54..15..10½
30,000	.2500..—..—	.576..18.. 5½	82.. 3..10

RULE. Multiply the principal by the rate *per cent.* and the number of months, weeks, or days, which are required, cut off two figures on the right-hand ſide of the product, and collect from the table the ſeveral ſums againſt the different numbers as when added will make the number remaining. Add the ſeveral ſums together it will give the intereſt required.

N. B. For every 10 that is cut off in months, add 2d; for every 10 cut off in weeks, add a halfpenny; and for every 40 in the days 1 farthing.

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EXAMPLES.

1. What is the intereſt of £2467..10..0. for 10 months at 4 per cent. per annum?

2467..10	900=75..—..—
4	80= 6..13..4
9370..—	7=—..11..8
10	987=82.. 5..—
93700	

2. What is the intereſt of £2467..10..—. for 12 weeks, at 5 per cent.?

2467..10	1000=19.. 4.. 7¼
5	400= 7..13..10
12337..10	80= 1..10.. 9½
12	50= —.. 2⅛
1480|50..—	1480|50=28.. 9.. 5

3. What is the intereſt of £2467..10..—. for 50 days at 6 per cent.?

2467..10	7000=19..3.. 6½
6	400= 1..1..11
14805..—	2=—..—.. 1¼
50	50=—..—.. —¼
7402|50	7402|50=20 .5..7

To find what any eſtate, from 1 to £60,000 per annum, will come to for 1 day.

RULE. Collect the annual rent or income from the table for one year, againſt which take the ſeveral ſums for one day, add them together, it will give the anſwer.

An eſtate of £367. per annum, what is that per day?

300=—..16.. 5¼
70=—.. 3..10
6=—..—.. 4
367=1..—.. 7¼

To find the amount of any income, ſalary, or ſervant's wages, for any number of months, weeks, or days.

RULE. Multiply the yearly income or ſalary by the number of months, weeks, or days, and collect the product from the table.

What

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What will £270. per annum come to for 11 months, for 3 weeks, and for 6 days?

For 11 months.

270	2000=	166..13..4
11	900=	75.. 0..0
	70=	5..16..8
2970		
	2970=	247..10..0

For 3 weeks.

270	800=	15.. 7.. 8¼
3	10=	0.. 3..10
810	=	15..11.. 6¼

For 6 days.

270	1000=	2..14.. 9½
6	600=	1..12..10½
	20=	0.. 1.. 1
1620		
	1620=	4..8.. 9

For the whole Time.

	247..10..0
	15..11..6¼
	4.. 8..9
	267..10..3¼

A TABLE, shewing the number of days from any day in the month to the same day in any other month, through the year.

From \ To	Jan.	Feb.	Mar.	Apr	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Jan.	365	31	59	90	120	151	181	212	243	273	304	334
Feb.	334	365	28	59	89	120	150	181	212	242	273	303
Mar.	306	337	365	31	61	92	122	153	184	214	245	275
Apr.	275	306	334	365	30	61	91	122	153	183	214	244
May	245	276	304	335	365	31	61	92	123	153	184	214
June	214	245	273	304	334	365	30	61	91	122	153	183
July	184	215	243	274	304	335	365	31	62	92	123	153
Aug.	153	184	212	243	273	304	334	365	31	61	92	122
Sept	122	153	181	212	242	273	303	334	365	30	61	91
Oct.	92	123	151	182	212	243	273	304	335	365	31	61
Nov	61	92	120	151	181	212	242	273	304	334	365	30
Dec.	31	62	90	121	151	181	212	243	274	304	335	365

EXAMPLE.

How many days are there from the 5th of July to the 5th of March?

Find July in the first column towards the left hand, and March at the head of the table, and in the angle of meeting you will find 243, the number of days required.

NOTE. In Leap year, if February be included, you must add one day to the number found in the table.

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A

COURSE of BOOK-KEEPING,

According to the method of Single Entry;

With a deſcription of the Books, and directions for uſing them.

PART VII.

BOOK-KEEPING, BY SINGLE ENTRY.

IN book-keeping by ſingle entry, two books are indiſpenſibly neceſſary, viz. Day-book and Ledger; the forms of which may be ſufficiently known by inſpection.

In the Day-Book every perſon is written down Debtor to the things he receives from you on truſt, and Creditor by thoſe which you receive from him.—In the margin of the Day-Book are written the pages where the accounts ſtand in the Ledger.—Inſtead of theſe marginal figures, ſome make only a daſh with the pen, to ſhew that the account has been poſted, that is, entered in the Ledger; but it is better to uſe the figures, for they ſhew not only that the account has been poſted, but likewiſe where to find it in the Ledger, without looking in the alphabet.—I have entered in the Day-Book what is received, as well as what is delivered, which is very neceſſary in teaching; for the learner ought to make out his Ledger from his Day-Book.

There are ſeveral other Books kept by moſt merchants, as the Caſh-Book, the Book of Houſe Expences, the Invoice Book, the Bill Book, &c. &c.

DIRECTIONS

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DIRECTIONS FOR THE READER.

YOUR Books being ruled in the proper form, copy into your Day-Book one month's accounts; then calculate them upon your ſlate, to find if they be rightly caſt up. Next, rule your ſlate in the form of the Ledger, and upon it poſt the accounts that were copied in the Day-Book, with their dates prefixed, obſerving to put on the Debtor ſide of each perſon's account, thoſe accounts to which he is debtor in the Day-Book, and on the Creditor ſide, thoſe by which he is Creditor, and if any accounts conſiſt but of one article, you are to expreſs it particularly with its money in the columns; but if of ſeveral, write *to* or *by* ſundries, placing the ſum of the amounts of all the articles in the columns. After the accounts are properly placed, tranſcribe them into your Ledger, leaving a proper ſpace under each perſon's name, to receive more accounts.

Then under the proper letters in the alphabet, enter thoſe names with the pages where they ſtand in the Ledger; and laſtly, write the Ledger pages to the ſeveral accounts in the Day-Book.

Do the ſame with the next month's accounts, and ſo on till the whole be finiſhed: You muſt not enter any perſon's name down again, which has been entered before, till the ſpace firſt aſſigned to it ſhall be filled with articles, and then the account muſt be transferred to a new place; and at the end of the old Ledger, draw out a balance account, placing your Debts on one ſide, and your Credits on the other.

THE

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THE DAY-BOOK.

		£.	s.	d.
	January 1, 1792,			
1	*Mr. John Holland, of York, Dr.*			
	To 7 yards of fine broad cloth, at 18*s.* 6*d.*	6	9	6
	—20— superfine ditto, — 19*s.* 8*d.*	19	13	4
	1.	26	2	10
1	*George Birch, Esq. of Bath, Dr.*			
	To 6 gallons palm sack, at 8*s.* 6*d.* per gal.	2	11	0
	— 9 — port, red, — 5 8 —	2	11	0
	— 9 — claret, — 8 9 —	3	18	9
	4.	9	0	9
1	*Mrs. Sarah Moore, Dr.*			
	To 2 lb. green tea, at 18*s.* 0*d.* —	1	16	0
	— 2½ congou, — 9 6	1	3	9
	— ½ stone of sugar, 5 0 per stone	0	2	6
	— A lump sugar, wt. 20lb. at 10*d.* per lb.	0	16	8
	9.	3	18	11
2	*Sir Joseph Johnson, Dr.*			
	To a silver punch bowl, wt. 23 oz. at 5*s.* 10*d.* per oz. —	6	14	0
	— a tankard, — 10 10 at 6*s.* per oz.	3	3	0
	20.	9	17	2
1	*Sir John Mosley, Dr.*			
	To a ream of fine post paper —	1	5	0
	27.			
2	*Mr. John Summers, schoolmaster, Dr.*			
	To 6 cyphering books, at 1*s.* 2*d.* each	0	7	0
	— 3 dozen copy books, 2 4 per doz.	0	7	0
	— 4 quires of fool's cap, 0 9 per qr.	0	3	0
	— 1 quire thin post, — —	0	0	8
	February 5.	0	17	8
1	*Mr. Anthony Archer, Dr.*			
	To a ledger, ruled, — —	1	0	0
	— 5 hundred quills, at 2*s.* per hund.	0	10	0
	— 4 reams thick post, 1*l.* 2*s.* 4*d.* per rm.	4	9	4
	— 8 reams fool's cap, 1 1 0 —	8	8	0
		14	7	4

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DAY-BOOK.

		£.	s.	d.
	12.			
2	*Mr. William Grove, Dr,*			
	To 4 gallons rum, 12*s.* 0*d.* per gallon	2	8	0
	— 2 — brandy, 8 0 —	0	16	0
	— 3 — Eng. gin, 4 6 —	0	13	6
	20.	3	17	6
2	*William Warner, Esq. Dr.*			
	To 10 oz, nutmegs, at 1*s.* 2*d.* per oz.	0	11	8
	— 4 pounds coffee, 4 0 per lb.	0	16	0
	— 5 — almonds, 1 2 —	0	5	10
	— 8 — raisins, 0 8 —	0	5	4
	27.	1	18	10
1	*Sir John Mossey, Cr.*			
	By cash received of him in full —	1	5	0
	March 22.			
1	*George Birch, Esq. of Bath, Dr.*			
	To 8 gallons sherry, at 6*s.* 4*d.* per gallon	2	10	8
	— 12 — rhenish, 6 6 —	3	18	0
	— 8 — Lisbon, 4 2 —	1	13	4
	April 24.	8	2	0
1	*Mrs. Sarah Moore, Cr.*			
	By cash received of her in full —	3	13	11
	May 3.			
1	*Mr. John Holland of York, Dr.*			
	To 25 yds. yd. wide cloth, 5*s.* 2*d.* per yd.	6	9	2
	— 8 ditto drugget, 5 8 —	2	5	4
	— 9 — serge, — 2 6 —	1	2	6
	— 36 — shalloon 1 8 —	3	0	0
	14.	12	17	0
	Mr. John Flint, of Nottingham, Dr.			
	To 12 pr worsted stockings, 4*s.* 2*d.* per pr	2	10	0
3	— 5 — silk ditto, — 16 4 —	4	1	8
	— 16 — thread ditto, 5 0 —	4	0	0
	June 3.	10	11	8
1	*Sir Joseph Johnson, Cr.*			
	By a bank note, received of his servant	5	0	0

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DAY-BOOK.

		£.	s.	d.
	June 12.			
3	*Mr. James Davies, Dr.*			
	To 8 qrs. Wheat, at 2*l.* 8*s.* 0*d.* per qr.	19	4	0
	— 4 — rye, 1 8 2 ——	5	12	8
	— 20 — oats, 0 10 9 ——	10	15	0
	17.	35	11	8
1	*Mrs. Sarah Moore, Dr.*			
	To 6 lb. hard ſoap, at 6½*d.* per lb.	0	3	3
	— 4 — ſoft ditto, 6 ——	0	2	0
	— 5 — ſtarch, 5 ——	0	2	1
	— 4 dozen candles, 6 per dozen	1	4	0
	June 21.	1	11	4
1	*Mrs. Sarah Moore, Cr.*			
	By caſh received in full ——	1	11	4
	July 7.			
2	*Mr. John Summers, ſchoolmaſter. Cr.*			
	By caſh received in full ——	0	17	8
	28.			
3	*Mr. James Davies, Dr.*			
	To 12 buſhels of Peas, 2*s.* 6*d.* per buſhel	1	10	0
	— 8 ——— beans, 2 2 ——	0	17	4
	— 10 ——— malt, 5 0 ——	2	10	0
	Auguſt 1.	4	17	4
2	*William Warner, Eſq. Dr.*			
	To 9 groſs bottles, at 3*s.* per groſs	1	7	0
	— 2 —— ſmall ditto, 2 0 ——	0	4	0
	— 4 decanters, — 1 4 each	0	5	4
	7.	1	16	4
1	*Mr. Anthony Archer, Cr.*			
	By a note upon Mr. John Steventon, for	10	0	0
	— caſh in full —— ——	4	7	4
	21.	14	7	4
2	*Mr. Charles Jones, of Shrewſbury, Dr.*			
	To 24lb. cochineal, at 1*l.* 2*s.* 6*d.* per lb.	27	0	0
	— 3 opium, 0 8 0 —	1	4	0
		28	4	0

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DAY-BOOK.

		£.	s.	d.
	September 4.			
2	*Mr. John Summers, ſchoolmaſter, Dr.*			
	To 12 ſchoolmaſter's guides, 2s. 2d. each	1	6	0
	— 3 dozen copy-books, 2 6 dozen	0	7	6
	— 1 ream fool's cap, — —	1	0	0
		2	13	6
	9.			
3	*Mr. John Flint, Cr.*			
	By a bank note for — —	5	0	0
	12.			
2	*Mr. John Summers, Dr.*			
	To 6 doz. ſpelling books, 10s. per doz.	3	0	0
	October 2.			
3	*Mr. Samuel Taylor, Dr.*			
	To 20lb. of flax at 1s. per lb.	1	0	0
	15.			
3	*Mr. John Johnſon, of Great Haywood, Dr.*			
	To 4½ cwt. iron, at 18s. per cwt.	4	1	0
	21.			
3	*Mrs. Phebe Young, Cr.*			
	By 60 yards of Iriſh cloth, 2s. 6d. yard	7	10	0
	27.			
1	*George Birch, Eſq. Cr.*			
	By caſh in full — —	17	2	9
	30.			
3	*Mr. Samuel Taylor, Dr.*			
	To 12lb. of flax, at 1s. 0d. per lb.	0	12	0
	— 10 — 0 6 —	0	5	0
	November 13.	0	17	0
1	*Mr. John Holland, Cr.*			
	By a bill for — —	20	0	0
	15.			
3	*Mr. James Davies, Cr.*			
	By caſh in full — —	40	9	0
	22.			
4	*Mr. Thomas Green, Dr.*			
	To 2 doz. knives and forks, 12s. per doz.	1	4	0
	— a ſet of china — —	3	10	6
	— a mahogany tea board —	0	12	0
		5	6	6

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DAY-BOOK.

November 26.	£.	s.	d.
Mr. Thomas Green, Cr.			
By 30 ells of holland, at 5*s.* 2*d.* per ell	7	15	0
28.			
Sir Joſeph Johnſon, Cr.			
By caſh in full —— ——	4	17	2
December 1.			
Mr. John Summers, ſchoolmaſter, Cr.			
By caſh in full —— ——	5	13	6
3.			
Mr. Anthony Archer, Dr.			
To a caſk of rum —— ——	10	0	0
6.			
William Warner, Eſq. Cr.			
By caſh in full —— ——	3	15	2
8.			
Mr. John Hunter, of Frieſely, Dr.			
To 4 tons of coals, at 7*s.* 6*d.* per ton	1	10	0
10.			
Mr. William Greve, Cr.			
By caſh in full —— ——	3	17	6
12.			
Mr. Carleſs, Dr.			
To a ton of oil, 236 gals. 2*s.* 6*d.* per gal.	29	10	0
13.			
Mr. John Johnſon, Cr.			
By caſh in full —— ——	4	1	0
18.			
Mrs. Hill, Dr.			
To a lump ſugar, wt. 26 lb. at 12*d.* per lb.	1	6	0
23.			
Mr. John Young, Dr.			
To 4 cwt. 2 qrs. cheeſe, at 32*s.* per cwt.	7	4	0
Mrs. Hill, Cr.			
By caſh in full —— ——	1	6	0

LEDGER.

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LEDGER.

THE ALPHABET.

A	B	C
Mr. Anth. Archer 1	George Birch Esq. 1	Mr. Careless 4
D	**E**	**F**
Mr. Jas. Davies 3		Mr. John Flint 3
G	**H**	**I**
Mr. Wm. Grove 2	Mr. John Holland 1	Sir Jos. Johnson 2
Mr. Thos. Green 4	Mrs. Hill — 3	Mr. Charles Jones 2
	Mr. John Hunter 4	Mr. Jno. Johnson 3
K	**L**	**M**
		Mrs. Sarah Moore 1
		Sir John Mosely 1
N	**O**	**P**
Q	**R**	**S**
		Mr. J. Summers 2
T	**V**	**W**
Mr. Sam. Taylor 3		W. Warner, Esq. 2
X	**Y**	**Z**
	Mrs. Phebe Young 3	
	Mr. John Young 4	

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1) 1792	*Dr.*	*Mr. John*	£.	s.	d.	1792	*Holland of York,*	*Cr.*	£.	s.	d.
January 1	To sundries	— —	26	2	10	Nov. 13	By a bill for	— —	20	0	0
May 3	To sundries	— —	12	17	0		By cash remains to balance		18	19	10
			38	19	10				38	19	10
1792	*Dr.*	*George*				1792	*Birch, Esq; of Bath,*	*Cr.*			
January 1	To sundries	— —	9	0	9	Oct. 27	By cash in full	— —	17	2	9
March 22	To sundries	— —	8	2	0						
			17	2	9						
1792	*Dr.*	*Mrs. Sarah*				1792	*Moore,*	*Cr.*			
January 4	To sundries	— —	3	18	11	April 24	By cash in full	— —	3	18	11
June 17	To sundries	— —	1	11	4	June 21	By cash in full	— —	1	11	4
			5	10	3				5	10	3
1792	*Dr.*	*Sir John,*				1792	*Moseley,*	*Cr.*			
Jan. 20	To a ream of paper	—	1	5	0	Feb. 27	By cash in full	— —	1	5	0
1792	*Dr.*	*Mr. Anthony*				1792	*Archer,*	*Cr.*			
Feb. 5	To sundries	— —	14	7	4	August 7	By sundries	— —	14	7	4
Dec. 3	To a cask of rum	—	10	0	0		By cash remains to balance		10	0	0
			24	7	4				24	7	4

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2) 1792	*Dr.*	*Mr. William*	£.	s.	d.	1792	*Grove.*	*Cr.*	£.	s.	d.
Feb. 12	To sundries.	— —	3	17	6	Dec. 10	By cash in full	— —	3	17	6

1792	*Dr.*	*Mr. Charles*					*Jones of Shrewsbury,*	*Cr.*			
August 21	To sundries	— —	28	4	0		By cash remains to balance		28	4	0

1792	*Dr.*	*Mr. John*				1792	*Summers,*	*Cr.*			
Jan. 27	To sundries	— —	0	17	8	July 7	By cash in full	— —	0	17	8
Sept. 4	To sundries	— —	2	13	6	Dec. 1	By cash in full	— —	5	13	6
— 12	To 6 doz spelling books, 10*s.*		3	0	0						
		— —							6	11	2
			6	11	2						

1792	*Dr.*	*William*				1792	*Warner, Esq.*	*Cr.*			
Feb. 10	To sundries —	—	1	18	10	Dec. 6	By cash in full	— —	3	15	2
August 1	To sundries —	—	1	16	4						
			3	15	2						

1792	*Dr.*	*Sir Joseph*				1792	*Johnson,*	*Cr.*			
Jan. 9	To sundries	— —	9	17	2	June 3	By a bank note	— —	5	0	0
						Nov. 28	By cash in full	— —	4	17	2
									9	17	2

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3) 1792	*Dr.*	*Mr. John*	£.	s.	d.	1792	*Flint, of Nottingham,*	*Cr.*	£.	s.	d.
May 14	To sundries — —		10	11	8	Sept. 9	By a bank note — —		5	0	0
							Cash remains to balance		5	11	8
									10	11	8
1792	*Dr.*	*Mrs.*				1792	*Hill,*	*Cr.*			
Dec. 18.	To a lump of sugar, 26lb. 12d.		1	6	0	Dec. 23	By cash in full — —		1	6	0
1792	*Dr.*	*Mr. John*				1792	*Johnson,*	*Cr.*			
Oct. 15	To 4½ cwt. of iron, at 18s.		4	1	0	Dec. 13	By cash in full — —		4	1	0
1792	*Dr.*	*Mr. James*				1792	*Davies,*	*Cr.*			
June 12	To sundries — —		35	11	8	Nov. 15	By cash in full — —		40	9	0
July 28	To sundries — —		4	17	4						
			40	9	0						
1792	*Dr.*	*Mr. Samuel*					*Taylor,*	*Cr.*			
October 2	To 20lb. of flax, at 1s.		1	0	0		Cash remains — —		1	17	0
30	To sundries — —		0	17	0						
			1	17	0						
	Dr.	*Mrs. Phebe*				1792	*Young*	*Cr.*			
	To balance — —		7	10	0	Oct. 21	By 60 yds Irish cloth, 2s. 6d.		7	10	0

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4) 1792	*Dr.* *Mr. Thomas*	£.	s.	d.	1792	*Green,* *Cr.*	£.	s.	d.
Nov. 22	To fundries — —	5	6	6	Nov. 26	By 30 ells Holland, at 5s. 2d.	7	15	0
	Cash remains to balance	2	8	6					
		7	15	0					

1792	*Dr.* *Mr. John*					*Hunter,* *Cr.*			
Dec. 8	To 4 tons of coals, at 7s. 6d.	1	10	0		Cash remains to balance	1	10	0

1792	*Dr.* *Mr.*					*Carlefs,* *Cr.*			
Dec. 12	To a ton of oil — —	29	10	0		Cash remains to balance	29	10	0

1792	*Dr.* *Mr. John*					*Young,* *Cr.*			
Dec. 23	To 4 cwt. 2 qrs. cheese, at 32s.	7	4	0		Cash remains to balance	7	4	0

BALANCE.

1792	*Dr.* Balance	£.	s.	d.		*Cr.*	£.	s.	d.
	To Mr. John Holland, due to me	18	19	10		By Mrs. Phebe Young — —	7	10	0
	To Mr. Anthony Archer —	10	0	0		By Mr. Thomas Green — —	2	8	6
	To Mr. John Flint — —	5	11	8			9	18	6
	To Mr. Samuel Taylor — —	1	17	0					
	To Mr. John Hunter — —	1	10	0					
	To Mr. Carlefs — —	29	10	0					
	To Mr. John Young — —	7	4	0					
		74	12	6					

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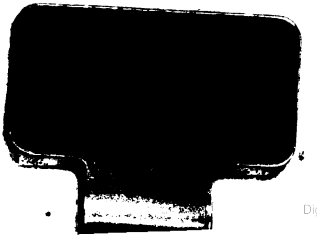

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